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PROCEEDINGS

OF

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139TH SESSION.

FROM NOVEMBER 1926 TO MAY 1927.

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THE LINNEAN SOCIETY OF LONDON.

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1927.

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PUBLICATIONS: Session June 1926–May 1927.

Journal, Botany.

Vol. XLVII. No. 315. 6/-
„ 316. 8/-

Journal, Zoology.

Vol. XXXVI. No. 244. 9/-
„ 245. 9/-

Proceedings, 138th Session, December 1926. 8/-

List of Fellows, Associates, and Foreign Members, Nov. 1926.

PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND THIRTY-NINTH SESSION,
1926–1927.)

4TH NOVEMBER, 1926.

Dr. A. B. RENDLE, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 10th June, 1926, having been circulated, were taken as read and were confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

The Rev. Charles Herbert Binstead, M.A. (elected 1925), and Mr. Charles Tate Regan, M.A., F.R.S. (elected 1926), were admitted Fellows.

Certificates were read for the second time in favour of Ernest John Stream, M.A., and for the first time in favour of Julian Herron Mitter, M.A., B.Sc.: Malte Oscar Malte, B.A., M.S., Ph.D.; William Rice; The Very Rev. David Paul, M.A., D.D., LL.D.; Theodore George Bentley Osborn, D.Sc.

Mr. G. TANDY gave an account, illustrated with diagrams, of abnormal fruiting branches of Sweet Chestnut (*Castanea vulgaris*), found near Brecon by Mr. W. P. J. Le Brocq, F.L.S.

The specimens showed catkins which were wholly female, whereas usually only a few female flowers are found at the base of an androgynous catkin. The occurrence of such catkins has been recorded several times, and certain trees have been found consistently to produce them.

Mr. T. A. Sprague made a communication, illustrated by lantern-slides, summarizing the results of three visits paid to Wistman's Wood, Dartmoor, in May 1926, by a small party of botanists, including Mrs. C. Le Lacheur, Miss M. L. Green, Dr. J. M. Dalziel, himself, and others.

The papers by Messrs. G. T. Harris, Miller Christy, and R. Hansford Worth (Trans. Dev. Assoc. Adv. Sc. 1921, liii. pp. 232–245; 1922, liv. pp. 291–342) give an excellent general account of the wood. Several additions were made to the flora, as recorded by these authors. *Salix cinerea* was found in the northern wood, a large patch (about 25–30 × 15 ft.) of *Salix aurita* was found in the central wood, and a hybrid between these two species occurred by the river-bank below the wood. A single small bush of *Corylus Avellana* was discovered in the central wood. *Salix aurita* and *Corylus Avellana* had already been recorded in Rowe's 'Perambulation of Dartmoor,' ed. 3, p. 203, but appear to have been overlooked since.

Among the epiphytic lichens collected were *Ramalina fastigiata* and *Cladonia Floerkeana* var. *carcata*, which are additional to those recorded by Miller Christy. Among those growing on boulders or on the ground were *Cladonia Floerkeana* and *Sticta fuliginosa*, which are also additional. The dark cavities between the boulders contained a varied Cryptogamic flora including the two filmy ferns, *Hymenophyllum tunbridgense* and *H. peltatum*, six mosses, *Eurhynchium prælongum*, *Mnium hornum*, *Plagiothecium elegans*, *P. undulatum*, *Pterygophyllum lucens* and *Polytrichum formosum*, a liverwort, *Diplophyllum albicans*, and a lichen, *Platysma glaucum* var. *fallax*.

Pyrus Aucuparia was much more abundant than had been indicated hitherto, and might be described as subdominant, at least in the southern and central woods. It occasionally occurred as an epiphyte on the oaks. The *Sedum*, which was so common in the wood and on the open moor around it, was *S. anglicum* (as recorded in Rowe's 'Perambulation of Dartmoor,' ed. 3, p. 203). It has recently been erroneously listed as *S. acre*. *Athyrium Filix-femina*, the occurrence of which was questioned by Miller Christy, was found to be fairly abundant. *Corydalis claviculata* was extremely abundant on boulders throughout the wood.

The data obtained in three visits to the wood were sufficient to show that it would well repay more intensive floristic and ecological study than has hitherto been devoted to it.

In the discussion that followed the reading of Mr. Sprague's paper, the President asked if there was any evidence of the wood decreasing in area. Mr. Miller Christy expressed his great interest and pleasure in the fine series of views, which, as far as he knew, were far better than anyone else had obtained. He congratulated Mr. Sprague and his party on the numerous additions to the list of species recorded by himself in the 'Transactions of the Devonshire Association.' He pointed out that the seeds of all the arboreal species hitherto recorded from the wood might have been carried by the larger birds, especially crows and thrushes,

across the three or four miles of moorland between the wood and the nearest trees at Princetown. Professor Augustine Henry expressed his high appreciation of the investigation of this remarkable wood. He desired acorns to be sent to him, so as to trace the development of the seedlings in normal soil and situation. He mentioned that he had raised, from seven acorns off a very ancient and decrepit oak, seven extremely vigorous seedlings. Dr. D. H. Scott suggested the possibility of the wood being a relic, spared, on account of its comparative inaccessibility, from the ravages of tinners. Mr. H. N. Dixon referred to the luxuriant growth of *Antrichia curtipendula* in the wood and its abundant fruiting. He also asked why the Rowan should suffer from the winter conditions in Wistman's Wood, when it appeared to be exposed to more rigorous conditions on the Scotch mountains.

Mr. H. N. Ridley pointed out that Wistman's Wood was an island of wood, of which all the trees were brought by birds, rooks, crows, or pigeons. The pedunculate oak was remarkable, as Clement Reid had shown that rooks generally carried its acorns by a twig, as the easiest way to carry them. Nuts might have been brought to the wood by pigeons chased and killed by hawks before they got deep enough into the wood. Dr. Dalziel remarked that hawks and pigeons were observed in the wood, but only carrion-crows nested in it. Mr. T. A. Dymes asked about the distribution of the two species of *Salix* in the wood, especially *S. aurita*, which was usually associated with a wet habitat. Mr. A. R. S. Proctor expressed the opinion that, as the Rowan is the last tree one meets when ascending any of the Cloughs of Kinder Scout in Derbyshire far above the oak-level, some special ecological conditions were at work in Wistman's Wood.

Mr. R. Paulson referred to a peculiar lichen with a much-galled surface among the collections from Wistman's Wood. He asked whether the trunks of small trees were sometimes much compressed by having to come up between closely-adjacent blocks, and if so whether the roots as they passed through the accumulated humus were covered with mycorrhiza before they reached a deeper soil. In his reply Mr. Sprague stated that there was no evidence of any tendency for the area of the wood to shrink, and that he had made no observations on mycorrhiza. The rainfall was sufficient for *Salix aurita*.

Dr. C. M. Yonge read his paper, illustrated with lantern-slides, on "The Ciliary-Feeding Mechanisms in the Thecosomatous Pteropods."

The shelled or Thecosomatous Pteropods obtain their food by means of ciliary mechanisms which have been developed on the unpaired middle and two side lobes of the foot. The ciliary mechanisms of the four species, *Cavolinia inflexa*, *Creseis acicula*, *Cymbulia peronii*, and *Gleba cordata*, show a progressive reduction in area. In the first two, food is collected on a wide ciliated field, in *Cymbulia* in two lateral grooves which lead to

the mouth, while in *Gleba* the mouth lies at the end of a proboscis up the sides of which lead ciliated tracts. Excess material is rejected by way of a tract of cilia anterior to the mouth. Correlated with this increased specialization and consequent efficiency of the ciliary mechanisms there is a reduction and final disappearance (in *Gleba*) of the buccal mass and its associated structures, jaws, radula, and salivary glands, which were probably handed down from carnivorous ancestors. Food is passed through the gut by ciliary and peristaltic action. There is a triturating gizzard, a digestive gland into which food passes and where it is probably assimilated, and at the junction of the two a ciliated diverticulum which contains a hyaline secretion strongly reminiscent of the crystalline style of the Lamellibranchs and certain Gastropods. As in those animals, it contains a starch-splitting ferment, and may be correlated with the presence of ciliary feeding mechanisms which collect food largely of a vegetable nature.

Professor E. W. MacBride expressed his deep interest in the paper, as Dr. Yonge was studying the evolution of habits rather than of structure. Although feeding by cilia was doubtless secondary in Pteropods, it should be remembered that the foot of all mollusca is primarily a ciliated organ. The young bivalve *Nucula* glides over the surface by the cilia on its foot, and some primitive Gastropods walk on their cilia; so that ciliated tracts in this region must always have been present. Mr. D. J. Scourfield was of opinion that Dr. Yonge was scarcely justified in regarding the triturating gizzard as merely reminiscent of the ancestry of the Pteropods. Nearly all the Rotifera fed in the same way as the Pteropods, by ciliary action, but they were provided with gizzards, which must be regarded as functional. Some of the Entomostraca also, such as *Daphnia*, fed on very small particles—the nannoplankton—and they also had good mandibles. Probably, therefore, the gizzards of the Pteropods were still functional. It was, however, difficult to understand what function a radula could have in Pteropods.

18th November, 1926.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 4th November, 1926, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

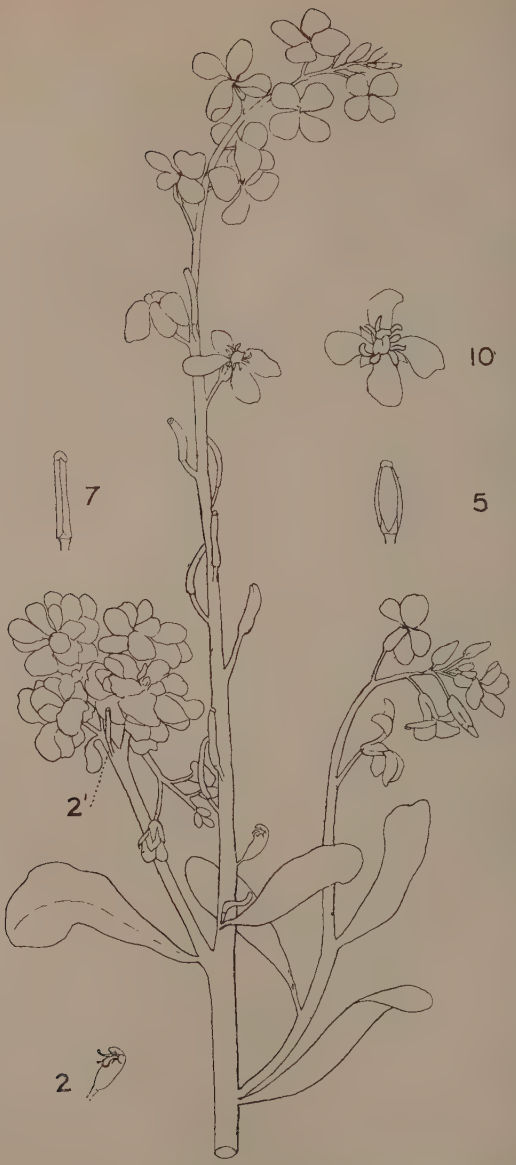
Sir Peter Henry Clutterbuck, C.I.E., C.B.E., F.R.G.S. (elected 1925), was admitted a Fellow.

Certificates were read for the second time in favour of Julian Herron Mitter, M.A.(Calc.), B.Sc.(Punj.); Malte Oscar Malte, B.A., M.S., Ph.D.; William Rice; The Very Reverend David Paul, M.A., D.D., LL.D.; Theodore George Bentley Osborn, D.Sc.; and for the first time in favour of Miss Rosamond Flora Shove, M.A.(Dubl.).

Miss E. R. Saunders read her paper on 'The Origin of the Double Stock.'

In the absence of any known record regarding the first appearance of the Double Stock (*Matthiola incana*) we have hitherto been able only to speculate as to its manner of origin. As I have stated elsewhere (J. Roy. Hort. Soc. vol. xl. p. 450), it appears to have been first mentioned by Dodoens (1568), who describes it as being very rare, because it is of the larger sort which begins to flower in the early spring, and also as being found in gardens. It was first figured (so far as we know) by Lobel (1581), who represents it as similar to the Double Stock of to-day in being fully double and absolutely sterile. Further information as to its origin we have none. In these circumstances a plant which appeared in the present season in an F_2 family from the cross pure-breeding glabrous single cream ♀ × double-throwing glabrous white ♂ is of considerable interest, *for the normal single and fully double condition were here exhibited in the same individual.* The cross was made in 1923 and the resulting seeds sown the same autumn. The F_1 plants, which were purple and hoary (the factorial constitution of the parents being RHK and BCK respectively)*, flowered in 1924. The seeds collected from one of these plants, which was covered, were not sown until the spring of 1926, when they yielded 179 hoary and 100 glabrous, of which 214 were single and 58 double. One of the hoary single-flowered plants produced six primary lateral axes in addition to the main axis. The flowers on the main axis were all typical singles, except flowers 2, 5, and 10. So also were those on the first, second, third, and fifth lateral axes. The three flowers mentioned above on the main axis and those on the fourth lateral branch were of one uniform type and altogether peculiar. The calyx and corolla were normal, but the stamens were represented by petaloid structures varying in number from 6 to 10 and showing no differentiation into filament and anther. In some two small median swellings gave hint of the lost anther lobes, but they contained no pollen. The gynœcium differed from the ordinary siliqua in being either 3- or 4-valved. In many cases it became ruptured in the flowering stage, revealing within a second set of petaloid structures and a second ovary. This intermediate type of flower, which had not previously been met with in the cultures which have now been carried out for nearly thirty years, is quite distinct from the partially double flowers, which

* H and K represent the factors producing hoariness, C and R those giving red sap colour, and B the factor that turns red to blue.



The lateral branch on the right bears single flowers, that on the left fully double flowers except one (2'), which shows a normal siliqua. 2. The ruptured 4-valved gynœcium of the second flower on main axis with a second set of petaloid structures protruding through the opening. 5. The intact 4-valved gynœcium of the fifth flower. 7. The normal siliqua of the seventh flower. 10. The tenth flower, with eight petaloid stamens and a 4-valved ovary.

are occasionally seen and which result from more or less complete "twinning" of the flower and flower stalk (see illustration of the Hoary Stock in the first edition of 'English Botany'). *The sixth branch produced fully double flowers indistinguishable from those borne by the ordinary double-flowered plant* except in the case of flower 2', which must have been single, since a normal siliqua was found after the other floral members had been shed. We thus have proof that the fully double condition may arise from the normal by a single step. It is therefore possible that the mutation which is here seen in only one branch of a plant may at some time have occurred throughout a whole individual, and so have given rise at one step to the double-flowered type. Portions of the single-, intermediate-, and double-flowered regions of this exceptional plant were preserved for cytological investigation which has since been carried out by Mr. E. J. H. Corner (see page 75).

In the discussion that ensued, Dr. A. W. Hill, Mr. E. G. Baker, Dr. E. J. Collins, Mr. R. J. Chittenden, and Prof. R. R. Gates took part.

Miss E. A. Chesters read her paper on "The Vascular Supply of the Bracts of some Species of *Anemone*," illustrating her remarks with lantern-slides.

The form and position of the bracts of various species of *Anemone* were described and compared with the bracts of *Eranthis hyemalis* and with the sepals of *Ranunculus Ficaria*.

A detailed study of the vascular system of the bract node of the species of the *Anemone* described shows that in types exhibiting a large leafy involucre the vascular system of the peduncle is dominated by that of the involucre. In species like *A. Hepatica*, in which the involucre closely approximates to a calyx, the incoming bundles take a less prominent part in the formation of the vascular ring of the axis. The resemblance between the course of the bract bundles of *A. Hepatica* and the sepal bundles of *Ranunculus Ficaria* is very striking.

The vascular supply of the bracts of *Eranthis hyemalis* resembles that of *A. nemorosa* in all essentials, suggesting that the modifications shown in the vascular system of *A. Hepatica* and *A. angulosa* are correlated with the reduction of the involucral leaves rather than with the difference in position.

The significance of the double ring of bundles which occur in several species of *Anemone* was discussed, but the evidence obtained in this investigation is regarded as insufficient to be in any way conclusive.

The vascular anatomy of the bracts and the bract node of these species of *Anemone* appears to support the view of the homology of the involucre of *A. Hepatica* and the calyx of *Ranunculus Ficaria*.

In the discussion that followed, Mr. W. C. Worsdell (Visitor) expressed the opinion that the course of vascular bundles was not

a safe guide to the homology of organs, although it was of value to know the course of such bundles.

Mr. J. C. Shenstone remarked that he had observed many years ago in a wood in Essex a form of *Anemone nemorosa*, with a peculiar form of sepal, in which one lateral half was petaloid in colour, form, and structure, and the other resembled in colour, form, and structure the longitudinal half of an involucral bract.

Miss T. L. Prankerd asked whether the author's views on the bracteal nature of *Anemone Hepatica* extended to the petaloid forms, such as *Pæonia*; also whether the author connected the inverted bundles of *Anemone* with Mrs. Arber's work on Monocotyledons, and whether there was an anatomical point of contact between the Ranales and Monocotyledons.

In her reply Miss Chesters stated that her investigations had not been sufficiently extended to warrant any inferences being drawn with regard to the questions raised by Miss Prankerd.

The President gave an account of the International Congress of Plant Sciences (Fourth International Botanical Congress) held in Ithaca, N.Y., U.S.A., from August 16–23 last. Ithaca is situated in the beautiful Finger Lakes District in Central New York at the head of one of the largest of the lakes, Lake Cayuga. The deep, picturesque gorges which run down towards the lake are the home of a rich flora; these and the various marsh-areas within easy reach of the town give opportunity for interesting botanical excursions. The extensive Cornell University Campus, on the heights above the town, with its numerous halls and buildings, afforded a pleasant and convenient home for the Congress. The official and social centre was the Willard Straight Hall, a well-arranged Student-Union Club, where cafeteria and restaurant meals were provided; the members were accommodated in the various hostels. More than 900 members registered, including about 100 from overseas. Excellent opportunities were provided for social intercourse, and a very friendly spirit pervaded the meeting. The members were welcomed at a General Meeting in the Bailey Hall on the first evening by Dr. Farrand, President of Cornell, and Prof. L. H. Bailey, President of the Congress and formerly Dean of the University. The invitation to meet in London in 1930 was given on behalf of the British botanists, and enthusiastically received: it was formally accepted at a second General Meeting held on the following Thursday.

The work of the Congress was distributed among thirteen sections, including, besides the purely botanical sections, cognate subjects such as Agronomy, Bacteriology, Forestry, Horticulture, and Pharmacognosy. Most of the sections met at 9 A.M. daily, from Tuesday to Friday, for reading of papers prepared at the invitation of the Executive Committee; afternoons and, in some sections, evenings were generally devoted to round-table discussions or symposia in which several sections joined. On some afternoons field-excursions were held, and there were several

public evening lectures. Sectional dinners or smokers were also arranged. The meeting was exceptionally well organised, and a very busy, pleasant, and profitable week was spent, marred only by the somewhat inclement weather, which completely spoiled the long day excursions which several sections had arranged for the Saturday. Most of the members left on the Sunday, many to take part in the various excursions which followed the Congress.

Some account was given of the Western Excursion, under Dr. George Fuller, of Chicago University, in which twenty-one members representing twelve nationalities participated. The party travelled by way of Niagara and Chicago across the prairie and through the Rocky Mountains to Salt Lake City, and thence to the Yellowstone Park, which covers an area of nearly 4000 square miles. Here several days were spent under the guidance of Prof. Henry Conard, of Grinnell University, who in the summer vacation functions as Chief Ranger-Naturalist of the Park. A brief account, illustrated by lantern-slides, was given of some of the features of this wonderland, including the geysers and hot springs, with their remarkable algal vegetation, the Great Canyon, the coniferous vegetation, the montane vegetation on Mt. Washburn, and the petrified forest on Specimen Ridge. Later, a few days were spent in the Rocky Mountain National Park, an area comprising 400 square miles of deep valleys and mountain peaks, with an interesting subalpine and alpine flora.

Time did not permit of discussion, but the Treasurer expressed the thanks of the meeting for the President's talk.

2nd December, 1926.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 18th November, 1926, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

Dr. Baini Prashad (elected 1925) was admitted a Fellow.

A certificate was read for the second time in favour of Miss Rosamond Flora Shove, M.A.(Dubl.).

A ballot for the under-mentioned was held, and they were elected Fellows:—Miss Isa. Martin, M.A.; Ernest John Stream, M.A.; Julian Herron Mitter, M.A.(Calc.), B.Sc.(Punj.); Malte Oscar Malte, B.A., M.S., Ph.D.; William Rice; The Very Rev. David Paul, M.A., D.D., LL.D.; Prof. Theodore George Bentley Osborn, D.Sc.

Mr. J. Ramsbottom exhibited a clump of seventeen mushrooms which were joined together at the base of the stem. They had been forwarded by Mr. L. M. Curtis, of Holbeach, Lincolnshire, having been found in a pasture there. A lantern-slide was also shown in which a mushroom bore three other full-grown mushrooms on the cap. The speaker suggested that such abnormalities were of little or no significance.

Mr. Ramsbottom then proceeded to give an account of the Society of Amateur Botanists. Mordecai Cubitt Cooke (1825–1914) was appointed head master of the new Trinity School, Lambeth, at the age of 23. Here he conducted evening botanical classes under the old Science and Art Department. In the later 'fifties he occasionally took his pupils for country rambles. Subsequently they were joined by outsiders, and in 1860 constituted themselves into the Society of Amateur Botanists. This was planned for excursions, interchange of specimens, communication of papers, and the establishment of a library, herbarium, and museum. Cooke was the first and only President. Excursions were held on alternate Saturdays, and meetings on alternate Wednesdays. At one time the Society numbered about fifty, and among the members and those who attended the meetings were James Britten, Thiselton Dyer, W. W. Newbould, Berthold Seemann, Worthington G. Smith, and Henry Trimen. Some of the papers read at the meetings were published in the 'Journal of Botany' or in the ephemeral 'Botanists' Chronicle.' The meetings were held first at the Metropolitan Club, Edgware Road, and then over the shop in Piccadilly of Robert Hardwicke, the publisher of natural history works. The formation of 'Hardwicke's Science Gossip' was described, and the manner in which a letter in the first volume (1865) from W. Gibson, suggesting an association of amateur microscopists "something on the plan of the Society of Amateur Botanists," led to the formation of the Quekett Microscopical Club. The new club enrolled 155 members in its first year. Excursions were carried out as with the Society of Amateur Botanists, many of whose members joined the new club. The Society languished and may be said to have been killed by the Quekett.

Slides were shown of the Trinity School, Lambeth, of a circular announcing evening botany classes conducted by Cooke, the cover of the 'Proceedings of the Society of Amateur Botanists' drawn by Worthington G. Smith (the original was also shown), and other examples of Smith's caricatures.

The President and Dr. E. Hartert (Visitor) remarked on the abnormal growth of mushrooms.

Dr. B. D. Jackson stated that the Society of Amateur Botanists was really before his time, so that his knowledge of it was second-hand. He recalled Mr. Britten speaking with some awe of "Trimen and Dyer" having the daring to read papers before it! Mr. W. W. Reeves had said that Mr. M. C. Cooke at the auction of the effects on the break-up of the Society, expressed his deter-

mination to acquire Mudd's 'Manual of British Lichens,' 1867, so the Society must have lasted at least five or six years. It met in a room over Robert Hardwicke's shop at 192 Piccadilly, now built over as part of Prince's Restaurant, though the speaker's memory of it had become faded.

Mr. C. E. Salmon then exhibited and commented on "Some interesting British Plants."

Vicia angustifolia Linn. var. *lutescens* Corbière was found on sea-cliffs in Cornwall and was at first thought to be *V. lutea*. Later, pods were seen on the plants and were finely pubescent, not coarsely hairy as in *V. lutea*, and were of a different type.

Alchemilla connivens Buser.—This is rather a small plant with decumbent stems, with a very graceful and beautiful habit, and may be known by its very fine and acute leaf-toothing, the deeply-cut and widely-separated lobes of the stem-leaves, and the remarkable shining silky veins on the under surface of the foliage. It grows at high elevations in Scotland and was seen first at Dalnaspidal, Perthshire, at about 2500 ft. elevation. It might be passed over as small *A. acutidens*.

Alchemilla tenuis Buser.—This was found on the Sow of Atholl and at a low elevation near Aviemore. It is a medium-sized slender plant, with rather narrow and acute toothing to the leaves, which are obviously hairy on both sides; the stipules are purple at the base; the stems are decumbent-ascending, the flowers small in sparsely-flowered corymbs. The only British species with which this may be confused is *A. minor* Huds. var. *filicaulis* Buser, but that has larger flowers, the leaf-toothing is different, and it lacks the purple stipules and the feature of heteropody.

Alchemilla Salmoniana Jaquet.—This was discovered in Cumberland at a height of about 2000 ft. The whole plant had a remarkable dark bluish-green tint, the stems were hairy below and glabrous above, with the branches forming a very acute angle with the axis, the leaves were hairy on both sides (more so above), and whilst the earlier petioles were very sparsely hairy, the later ones were strongly so. The flowers were large, in small compact corymbs, and the fruiting sepals quite erect. Dr. Jaquet noted that the plant possessed some characteristics of the group Splendentes (of which we have no representative in Britain), but, on the whole, it was perhaps better included in the group Heteropodæ, coming next to *A. tenuis*.

Myosotis brevifolia Salm.—This new species of *Myosotis*, found in marshes in the Cross Fell district, bears short, broad, blunt leaves and produces numerous rooting stolons above ground; its pubescence is appressed, its corolla pale blue, almost as large as that of *M. repens*, the calyx is deeply divided, rather more than half-way, and the segments are oblong, rounded or blunt at the apex; its style is very short.

From *M. palustris* it differs by its longer calyx segments, smaller flowers, shorter style, etc.; from *M. cæspitosa* by its

having stolons, its shorter blunter leaves, longer calyx segments, larger flowers, etc.; from *M. repens* by its appressed pubescence, smaller stolon leaves, blunt calyx segments, shorter style, etc. Its closest Continental ally would seem to be the rare Spanish *M. stolonifera* Gay, an alpine plant from the Asturias, but that is only 2″–3″ high, has spathulate stem-leaves and acute calyx segments.

Mr. H. W. Pugsley remarked that *M. brevifolia* seemed distinct, though intermediate between *M. repens* and *M. cæspitosa*.

Mr. A. J. Wilmott commented on the interest of the existence of yellow flowers in *Vicia angustifolia* and on the new *Myosotis* which he thought he had found in Teesdale in 1919, but in very small state, without stolons, and with a yellowish-green colour.

Prof. F. E. Weiss stated that Strasburger had indicated that the numerous closely-allied forms of *Alchemilla* were probably due to the apogamy of this plant. As the seeds were produced apogamously, every mutation would be perpetuated.

Mr. Salmon replied to these remarks and to the questions of other speakers.

Following this, Mr. J. H. Owen (Visitor) showed a very fine series of lantern-slides of the Sparrow-Hawk and the Great Crested Grebe.

The President remarked on the excellence of the slides and on the patience and care which must have been bestowed in obtaining the photographs.

Dr. Hartert commented on the manner in which the young were protected from hot sunshine, stating that otherwise they would succumb.

Mr. F. H. Lancum stated that the Buzzard repairs its nest in a manner similar to the Sparrow-Hawk: he had noticed the hen-birds leave and return with twigs. When putting rings on a brood of young Buzzards he had been struck by the fact that even at that period the lining of larch-branches was fairly fresh.

Lt.-Col. J. H. Tull Walsh, Mr. Miller Christy, Mr. H. N. Dixon, Dr. A. W. Hill, and Miss Lister also contributed remarks, to which the author replied.

16th December, 1926.

Dr. A. B. Rendle, F.R.S., President, in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 2nd December, 1926, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

Edward Battiscombe (elected 1923), William Nowell (elected 1922), William Rice (elected 1926), and Arthur George Tansley (elected 1926) were admitted Fellows.

Certificates were read for the first time in favour of:—Ernest St. John Burton, F.G.S., and Christopher Martin Ingoldby, M.R.C.S., L.R.C.P., R.A.M.C., F.Z.S., F.R.G.S.

A ballot was held in respect of Miss Rosamond Flora Shove, M.A., and she was elected a Fellow.

The PRESIDENT announced that the rooms of the Society would be closed from 5 P.M. on the 24th December, 1926, until 10 A.M. on the 28th December, 1926.

The PRESIDENT, in the absence of the author, read a communication by Mr. Edwin Ashby entitled "Notes on the Flora of the Grampian Mountains of Victoria, Australia." Specimens of some endemic plants of the region were exhibited.

The range is situated in western Victoria, and covers an area of about 60 by 30 miles; the rocks are sandstone, with quartzite and intrusive rock in a few places. It forms an ecological islet rising abruptly from hundreds of miles of undulating plains, and is a meeting-place of the east and west as regards its flora. Fifteen species are endemic, including four species of the Leguminous genus *Pultenæa*, *Trymalium Daltoni*, a Rhamnaceous species with an ericoid habit, *Calythrix Sullivani*, a striking Myrtaceous species, *Eucalyptus alpina*, a small tree growing at 2000 feet altitude, *Olearia speciosa* (Compositæ), *Leucopogon thymifolius* (Epacridaceæ) and single species of the genera *Hibbertia*, *Bauera* (Saxifragaceæ), *Stylidium*, *Grevillea*, and *Prostanthera* (Labiatæ), also a terrestrial orchid, *Caladenia iridescens*, which flourishes high up in the barren stony mountain soil.

The President referred to papers in the 'Victorian Naturalist' by Mr. J. W. Audas, F.L.S., of the National Herbarium, Melbourne, descriptive of the scenery and plant-life in these mountains.

The Treasurer expressed the thanks of the meeting to Mr. Ashby for his communication and to the President for his exposition of it. Mr. E. G. Baker referred to the distribution of the genus *Pultenæa* in Australia. The species occurring in Western Australia are—with few exceptions—endemic, and those found in Victoria are mostly confined to that State.

Dr. W. T. CALMAN exhibited a specimen of the Giant Teredo.

The Giant Teredo, *Kuphus arenarius* (Linn.), first described by Rumphius two hundred years ago, has hitherto been known chiefly by its massive shelly tube, which may be as much as four feet in length and three inches in diameter at the wider end. The specimen exhibited is believed to be the first example of the soft parts examined by any naturalist. It was collected by

Captain Burgess, of the Mission steamer 'Southern Cross,' in the Solomon Islands, and forwarded by Mr. D. Holderness, Harbour Engineer, Auckland, N.Z., to the Sea Action Committee of the Institution of Civil Engineers. It comprises some thirteen inches of the posterior end of the body, with the siphons and pallets. Instead of boring in wood like the other Teredinidæ, *Kuphus* lives embedded in the mud of mangrove-swamps, with the siphons projecting from the surface. The valves of the shell have never been seen in full-grown examples, and it is possible that they disappear in course of growth. There are some indications that the mud-living *Kuphus arenarius* may be the full-grown condition of a timber-boring species (perhaps *Teredo mannii*) which is set free by the decay of the wood. If this be the case, however, it is somewhat of a mystery how the animal maintains its position in the mud, for the sucker-like foot of the Teredinidæ seems ill-fitted for locomotion in these conditions.

In the discussion that followed, Mr. R. H. Burne mentioned the specimens of the Giant Teredo in the Museum of the Royal College of Surgeons, which were found in 1797 in mud stated to have been hard.

Professor E. W. MacBride said that the Teredo described by Dr. Calman afforded a valuable instance of how new species were formed. This Teredo, beginning its life under normal conditions, finds itself, by the disappearance of the wood, in quite new circumstances, under which, however, it can get abundance of food, as witnessed by the extraordinary size. Under such circumstances animals do not succumb, but adapt themselves and grow enormously. As another example of this, Professor MacBride mentioned a case that had come under his observation, in which some beetle larvæ accidentally introduced into a child's alimentary canal grew to a size far exceeding the normal.

Dr. G. P. Bidder suggested that if the habitat of this Teredo should be in an area of alluvial deposit, the erect position might be maintained merely by upward growth as the mud was deposited over the mangrove roots. The change from boring habit and small size to non-boring life and large size afforded an interesting parallel with the boring sponge *Cliona*, the adult form of which is the massive *Raphyrus griffithsii*. A similar metamorphosis occurs probably, according to Vosmaer, in Neptune's Cup and many allied sponges.

In reply, Dr. Calman pointed out that the direction of growth of the Teredo tube was downwards, additions taking place at the wider anterior end.

Mr. J. R. Norman gave an account, illustrated with lantern-slides, of "Ambicoloration and Associated Variations in Flatfishes."

The phenomenon of ambicoloration in Flatfishes is of particular interest on account of the other variations towards symmetry which accompany complete (or almost complete) pigmentation of

the blind side. The modification of the scales on the blind side to resemble those of the ocular side in the Dab (*Pleuronectes limanda*), and the development of bony tubercles on the blind side of the body in the Turbot (*Rhombus maximus*) are characteristic variations of this nature. Another correlated variation is the delayed or arrested migration of the eye, which interferes with the forward growth of the dorsal fin and leads to the formation of a characteristic fleshy hook on the head. In the Southern Flounder (*Rhombosolea tapirina*) of Australia, in which only a single pelvic fin is normally developed, two symmetrical pelvics of equal size are present in completely ambicolorate examples.

The tendency for ambicoloration in Flatfishes to affect the head last of all may be noted: this is the region where the asymmetry is most marked.

Mr. C. Tate Regan said that these associated variations were of special interest because, although they were at first sight very different, relating to pigmentation, to scale structure, and to the rate of migration of the eye of the blind side, it could be seen that they were all expressions of a tendency towards symmetry. It was unnecessary to suppose that genes responsible for them resided in the same chromosome. Pigmentation of the blind side produced experimentally by light was more or less uniform and dark, not a reproduction of the colour and pattern of the eyed side such as is seen in ambicolorate fish.

Dr. Bidder asked whether Mr. Norman agreed with the view that had been expressed by Mr. Cunningham that the partial coloration of the tail end was due to a certain amount of light being admitted under the tail.

Dr. Calman asked whether the presence of a fleshy hook at the anterior end of the dorsal fin in Mr. Cunningham's figure did not indicate that the experiments began with a fish already partly symmetrical.

In reply, Mr. Norman stated that he did not consider that Mr. Cunningham's experiments threw any light on the question of the cause of ambicoloration, as the pigmentation produced seemed to be of a different nature and to be distributed in an indefinite manner.

6th January, 1927.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 16th December, 1926, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

John McDonald, D.F.C., B.Sc. (elected 1925), Ernest John Stream, M.A. (elected 1926), and Miss Helen Mary England, M.Sc. (elected 1926), were admitted Fellows.

Certificates were read for the second time in favour of:—Ernest St. John Burton, F.G.S., and Christopher Martin Ingoldby, M.R.C.S., L.R.C.P., R.A.M.C., F.Z.S., F.R.G.S. The certificates were ordered to be suspended.

The PRESIDENT announced that, owing to the death of Miss Matilda Smith on the 29th December, 1926, a vacancy existed in the list of Associates of the Society. He paid a tribute to the great value of Miss Smith's work as a botanical artist continued for so many years and expressed the regret of the Society at her loss.

The PRESIDENT showed a series of lantern-slides illustrating some of the early botanical collections from North and Central America contained in the Sloane Herbarium at the British Museum. These included a small collection of mosses and liverworts from Virginia by the Rev. William Clerk (1729), and one of flowering plants from the same collector arranged in months according to the time of flowering; a collection by Joseph Lord from Carolina (1704) containing good specimens with neatly-written descriptive labels; extensive collections from Carolina and Virginia in 1710 and 1711 by John Lawson, Surveyor-General of North Carolina from 1701–11, who met his death in an expedition against the Indians in the latter year [many of the specimens bear Lawson's original labels with date, locality, and other information, and references to his book, 'A New Voyage to Carolina' (1709)]; examples from James Petiver's *Hortus Siccus Americanus*, which was purchased by Sloane and forms part of his Herbarium [among these are specimens sent from the Scots Settlement in Darien by Archibald Stewart, Surgeon (1699)]; and collections from Maryland by the Rev. Hugh Jones (died 1701), a resident in Calvert County, Maryland, and by William Vernon and Dr. Kreig, who made a joint expedition to Maryland (1698) and brought home a large number of plants, which were catalogued by John Ray, and some of his annotations are preserved with the specimens. They were later named by Dr. Solander, in whose manuscripts are descriptions of the novelties. Photographs were also shown illustrating a collection by William Bartram (1739–1823), containing specimens of the plants mentioned in his 'Travels through North and South Carolina, Georgia, &c.' (1791).

Mr. CECIL NORMAN read a paper, illustrated with lantern-slides, on the Pimpinellas of Tropical Africa.

Pimpinella, an Umbelliferous genus of plants, is well represented in Tropical Africa by about 25 species. It occurs in all parts of

the tropical region, usually in open country at an elevation of not less than about 3000 ft., and it ascends as high as 10,000 ft. on the mountains.

With one exception all the species belong to the subgenus *Eu-pimpinella*, and both sections of the subgenus, viz. *Tragoselinum* and *Tragium*, are well represented. Again, with one exception, all the species are perennials or biennials, the exception being a delicate little annual from Eritræa. They are nearly always found growing amongst grasses in open country—there are frequent references to this on the collectors' tickets,—and they do not seem to occur in country that is at all densely wooded.

So far as it is possible to form an opinion, it seems that the species are restricted in range for the most part, the exceptions to this being *P. oreophila*, *P. Buchananii*, *P. simensis*, and, perhaps, *P. Volkensii*, which are very widely dispersed. Only one species seems to occur in Tropical and South Africa, and that is the common *P. caffra*, which reappears unexpectedly in Abyssinia.

The President expressed the thanks of the meeting for Mr. Norman's paper, and referred to the great value of such monographic work as Mr. Norman was carrying on. Mr. E. G. Baker mentioned the difficulties encountered in working up Tropical African genera, owing to so many of the type-sheets being in foreign herbaria.

Mr. A. J. Wilmott gave a preliminary account, illustrated with specimens and lantern-slides, of a botanical expedition to the Sierra Nevada of Spain last June with Mr. T. A. Lofthouse. Lantern-slides showed the arid nature of the vegetation at both ends of the range, trees being almost absent except by the streams and in gorges. At the west end an ascent was made to over 9000 ft. towards the Veleta, which rises to about 11,000 ft. The snow was more abundant than usual and the season very backward, but many interesting plants were gathered. Ascents were also made to the Dornajo, a lower limestone ridge from which Boissier described many new species gathered during his visit in 1837. Many of these were gathered on this excursion along the path followed by Boissier, including the rare *Convolvulus nitidus* from the summit of the ridge. The last hour's descent into Guejar, in the gorge of the R. Genil, was extremely steep but through open woodland. The journey to the eastern end was by Correos motor-bus *via* Lanjaron, Berja, and Laujar, and specimens were gathered at each of these places. Minas de Beires, a mining hamlet some 3000 ft. above Beires, was reached by mules, and a fortnight was spent at the manager's bungalow (5760 ft.) overlooking the Mediterranean near Almeria. This area seemed botanically unexplored, and many interesting plants were collected, several within a stone's throw of the bungalow. Ascending to the crest of the Sierra Nevada, a zone of *Erinacea pungens* occurs between 6000 and 7000 ft. and one of the spiny *Astragalus*

nevadensis near the crest. The deep gorge of the R. Chanes contained several species not previously recorded so far south—e. g., *Pinguicula grandiflora*. Altogether nearly 3000 gatherings were made during the five weeks, and several long series of critical species were brought back to the Natural History Museum. The expedition was made possible by a grant from the Trustees, whereby Mr. Wilmott was enabled to take advantage of the hospitality offered by Mr. Lofthouse's friend at the mines.

Owing to the lateness of the hour, there was little time for discussion, but in reply to questions put by Dr. D. H. Scott, Mr. E. G. Baker, and Mr. A. H. Maude, the author of the paper stated that no British species of *Teucrium* was found on the Sierra Nevada. He had found only one *Cistus* (*C. albidus*), but several species of *Helianthemum*. *Gentiana verna* occurred in the wetter places, and he had come across one *Primula* (*P. intricata*).

Mr. W. B. Turrill referred to the resemblances and distinctions between the Floras of the Balkan and Iberian Peninsulas, pointing out that many species were common to both areas but not found in the intervening lands. The Sierra Nevada seemed much more bare of arboreal and shrubby vegetation than the Balkan mountains.

Mr. S. K. Mukerji remarked on the distribution of *Mercurialis* in Spain.

20TH JANUARY, 1927.

Dr. A. B. RENDLE, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting held on Thursday the 6th January, 1927, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table,

Miss Rosamond Flora Shove, M.A.(Dubl.) (elected 1926), was admitted a Fellow.

A ballot for the under-mentioned was held, and they were elected Fellows:—Ernest St. John Burton, F.G.S., and Christopher Martin Ingoldby, M.R.C.S., L.R.C.P., R.A.M.C., F.Z.S., F.R.G.S.

The PRESIDENT announced that a Meeting would be held in the Society's Rooms at 3.30 P.M. on Thursday the 27th January, 1927, to initiate arrangements for the Fifth International Botanical Congress to be held in England in 1930. All interested in the subject of the Meeting were invited to attend.

Professor H. Graham Cannon gave an account of a paper by Miss S. M. Manton and himself entitled "Notes on the Segmental Excretory Organs of Crustacea," of which the following is a summary:—

The patterns of the maxillary gland efferent ducts of the Branchiopoda show a marked uniformity. The simplest type is that of *Estheria*. In *Chirocephalus* there is a divergence from this pattern, probably correlated with the absence of a shell-fold. In the maxillary gland of *Anaspides*, hitherto undescribed, the pattern of the duct is the same as that of *Chirocephalus*.

The maxillary gland of both *Anaspides* and *Chirocephalus* possesses a muscular sphincter controlling the exit of the efferent duct from the end-sac. The entire gland is mesodermal, so that the sphincter is not homologous with the analogous structure in the antennal glands of the Branchiopoda.

The Lophogastridæ represent primitive Peracarida, from which both the modern Mysids and Isopods could have evolved. The segmental excretory organs of the former are antennal glands and of the latter maxillary glands. *Lophogaster* possesses both antennal and maxillary glands.

The President complimented Professor Cannon and Miss Manton on their paper. In the discussion that ensued Dr. W. T. Calman commented on the importance of the results obtained by the authors and on their success in overcoming the technical difficulties of the investigation. He expressed his general agreement with their conclusions, but drew attention to the phylogenetic difficulties involved in assuming a direct affinity between *Anaspides* and the Anostraca. The Malacostraca, as a whole, must have been derived from forms that possessed a carapace, and the lack of a carapace in *Anaspides* could not be attributed to descent from Anostracan-like ancestors such as *Lepidocaris*.

Professor E. W. MacBride expressed agreement, in the main, with Dr. Calman's remarks and the hope that the authors' conclusions would be based on mature considerations. He asked whether the labyrinthine end-sac of *Pandalus* was homologous with the glandular portion of the green gland in *Astacus* and the higher Crustacea generally.

Miss Manton mentioned that in *Gennadas*, at the junction of the end-sac and duct, some of the end-sac cells were extremely elongated, projecting into the end-sac and forming a valve. No muscle fibrils were present. In no other adult Decapod had a valve between end-sac and duct been described, and here it resembled that of *Anaspides* in an exaggerated form.

Dr. Bidder asked whether the pattern of duct found in other Crustacea differed noticeably from that shown. As a bight drawn out into a half circle it was possibly the simplest way in which a lengthening tube could be stowed.

Professor Cannon, in reply, stated that in certain other Crustacea the convolutions of the excretory duct formed no definite pattern. With reference to the phylogenetic difficulties alluded to by

Dr. Calman, he was not convinced that the carapace was completely homologous throughout the Crustacea. The labyrinthine end-sac was involved in the glandular portion of the "green gland" in the higher Decapods.

Professor R. R. Gates gave an account, illustrated with a large series of lantern-slides, of the Tundra Vegetation of Russian Lapland.

The observations were made while on a visit to the plant-breeding station at Khibiny, in Russian Lapland, north of the Arctic Circle, in lat. 67° 44′ N. A station was opened here in 1923 for the breeding chiefly of vegetables suitable to this northern country, which is being colonized from the south and is two days' journey north from Leningrad by train over the Murmansk Railway, past Lake Onega and the White Sea. Khibiny is on Lake Ymandra, and is partly surrounded by mountains which reach a height of nearly 4000 feet.

The summer season begins about the middle of June, when the ice goes out of the lake, and ends about the middle of August. During this short season most of the plants bloom twice, June and August. The snowfall is not heavy and the rainfall about 450 mm. In February the lowest temperature is about −36·4°F., while in June (the warmest month) the mid-temperature is 53·6° F. and the maximum 86° F. There is very little rain from May to August, but the winds are always very strong and have a marked effect on the vegetation.

This country was heavily glaciated; the only trees are *Pinus sylvestris* var. *lapponica*, *Picea obovata*, *Betula pubescens*, and *B. verrucosa*; the conifers form extensive more or less open forests and the flowering plants number only 300–400 species. The bulk of them are plants named by Linnæus, and many of them are rarities in our own flora, being found, if at all, chiefly in the Highlands of Scotland or the North of England.

Lake Ymandra was formerly much larger than now, and former levels can be easily traced in ascending the slopes of the mountains. The lower slopes are composed chiefly of morainic material, which has been much shifted by streams in the post-glacial period. In ascending a peak 1500 feet high one finds on the lowel levels the trees mentioned, together with *Betula nana* on the moors, becoming commoner as we ascend. The undergrowth consists of *Vaccinium uliginosum*, *V. Myrtillus*, and *V. Vitis-idæa*, *Arctostaphylos Uva-ursi* (replaced by *A. alpinum* higher up), as well as *Ledum palustre*, *Calluna vulgaris*, *Epilobium angustifolium*, and *Rubus saxatilis*. Quantities of spring mosses, *Hylocomium splendens*, *Hypnum Schreberi*, *Polytrichum*, and *Sphagnum* give character to these slopes.

At the second level the trees are more scattered, while at the third level, 100 metres above the lake, the spruces are covered with lichens, especially *Alectoria jubata*, *Usnea barbata*, and *Evernia prunastri*. Cladonias now become more common on the ground

and *Empetrum nigrum* is more abundant at higher levels. Here also are such plants as *Juniperus communis*, *Linnæa borealis*, *Geranium pratense*, and *Sordus Aucuparia*.

Ascending further, we pass the tree-line. The rocks now are large, cleaved, and faulted blocks of nepheline syenite partly covered with vegetation. In pools caused by the faulting are beautiful colonies of *Eriophorum polystachyon* and *E. vaginatum*, while the smaller *E. alpinum* occurs at lower levels. Fringing the pools are dwarf willows and such plants as *Taraxacum* and *Pinguicula vulgaris* and *P. alpina*. On these wind-swept slopes many of the plants are much reduced in size. *Loiseleuria procumbens* is here, as well as *Tofieldia alpina*—*T. borealis* occurring at low levels. *Picea* and *Juniperus* are reduced to Krumholz forms creeping over the rocks. The most typical plants at these higher levels are *Arctostaphylos alpinus*, *Betula nana*, *Juniperus nana*, and mats of reduced *Vaccinium* and *Andromeda polifolia*. This is typical rock tundra. Several species of *Cladonia* are abundant, and several Carices, of which over twenty species occur in this region, are characteristic of the higher levels. They form large yellowish patches on the hills, which can be recognized at a distance. *Silene acaulis* occurs here as well as by the lakeside, which is over 400 feet above sea-level. At the summit, where there is a small meteorological station, the few scattered plants included *Linnæa borealis*, *Dryas octopetala*, and *Juncus* sp., while on the highest peaks are found *Oxytropis campestris* and *Saxifraga oppositifolia*. Farther north, on the Murmansk coast, this mountain vegetation comes down to sea-level.

In the sand along the lake-shore were bolsters of *Silene acaulis* and *Diapensia lapponica*, as well as *Papaver radicatum* var. *lapponicum* with large yellow flowers, *Empetrum nigrum*, *Calluna vulgaris*, *Arctostaphylos Uva-ursi*, *Oxytropis campestris*, and *Saxifraga aizoides*. All except the last, which characteristically borders pools in the sand, have largely-developed root-systems.

Along the river Lutnermajoki, which flows into Lake Ymandra, are found such mesophytes as *Geum rivale*, *Maianthenum bifolium*, *Trollius europæus*, *Tussilago Farfara*, *Trientalis europæus*, and *Equisetum sylvaticum*. The small birches, alders, and willows (*S. alba*) here are cut to make "tree hay" for the cattle and sheep. Other plants commonly found at the lower levels in this district include *Parnassia palustris*, *Comarum palustre*, *Spiræa Ulmaria*, *Allium Schœnoprasum*, *Silene inflata*, *Lonicera cærulea*, and *Rosa acicularis*. Dr. Hurst informs me that this is a new most northerly record for *Rosa*—this species being known in Alaska, but from a lower latitude.

There are many kinds of tundra in Russia, and a brief classification may be attempted. There are several types both of rock tundra and moor tundra. The mountain rock tundra, which occurs above the tree-line at Khibiny, is very similar to the low rock tundra which is found on the Arctic coast. Moor tundra is typical of Siberia, and but little of it is found in

the Kola Peninsula. Cladonias and other lichens make up a conspicuous element and give a whitish character to the landscape. This may be free from trees (chuna tundra) or may be interspersed with pine. Mingled with these ground-lichens may be such forms as *Empetrum*, *Arctostaphylos*, and *Calluna*.

In the Ural Mountain is Flecken tundra, characterized by its patchy covering of vegetation with areas of bare yellow clay between, the latter being apparently the result of frost action. Another type of rock-tundra, which is known as Klotschkovataya, or tufted tundra, occurs in the Kola Peninsula. The surface of the ground is broken into polygonal areas, which may be thirty feet across and are covered with vegetation. Between these "Klotschy" are crevices which may be ten feet deep and six feet wide, with vegetation at the base.

All these forms of tundra have many features in common, Cladonias and other lichens as well as heaths and woody creepers being conspicuous elements in the plant-covering. Tundra-vegetation appears to be chiefly the result of a soil which is wet and frozen during much of the year, general low temperature, and continuous high winds. The continuous daylight during the greater part of the summer season, no doubt, favours quick maturity in the flowering plants. Occasional summer fogs occur, but farther north on the Murmansk coast they are much more frequent and very dense.

The President expressed the thanks of the Meeting for the interesting paper, and went on to ask why the growing of such plants as Maize and *Ricinus* should have been attempted at all in such latitudes, whether forest-fires occurred, and whether the second flowering had to do with lack of pollination in the first set of flowers. Mr. A. J. Wilmott suggested that many British species flower twice in the year, including *Silene acaulis* mentioned by Professor Gates. He asked for information regarding the habitats of the several species of Orchids that were recorded to the extreme northern coast. He also mentioned the existence of several wild Arctic species of Dandelion.

Mr. H. N. Ridley referred to the alteration in the feeding-habits of domestic animals mentioned by Professor Gates, and stated that in northern Norway he had seen cattle fed on dried birds. A pet Tapir which he had kept when at Singapore had the habit of eating bones. As regards the second flowering of plants, he had seen in Northern Norway three successive crops of hay gathered in the same season.

Mr. A. H. Maude drew attention to the fact that so many high-latitude species were also alpine. He attributed the second flowering to the almost constant stimulation caused by more or less continuous daylight during the summer. He asked whether the forests underwent natural regeneration to any extent, and whether they were increasing or diminishing. He also sought information as to the prevalence or otherwise of grasses.

Mr. S. K. Mukerji spoke of the general similarity as regards

succession of vegetation between Russian Lapland and the high levels of Western Himalaya. He suggested the possibility of the forest in Russian Lapland being cut down to extend the Lichen bottom for grazing, just as in the high levels of the Western Himalaya graziers from Central Asia cut down the forest in order to extend their grazing-grounds.

Mr. A. R. S. Proctor pointed out that in the area described by Professor Gates there did not appear to be the "elfin wood" gradation—as postulated by Warming—usual under Tundra conditions in the *Pinus* and *Picea* woods. He considered it highly probable that the second flowering of *Silene acaulis* was due to the great amount of daylight. He mentioned that in 1921, under the extra stimulus of the unusual amount of sunshine experienced in that year, *Silene* flowered profusely in Breadalbane in September.

Mr. D. J. Scourfield mentioned the north of Sweden as possessing features very similar to those of Russian Lapland and more easily accessible.

Mr. T. A. Dymes instanced *Arctostaphylos Uva-ursi* as having been found to flower twice in a season in Yorkshire.

Mr. V. Summerhayes stated that all stages of "flecken-moor" were to be seen in most arctic countries. The "rock-lake" was definitely related to "flecken-moor," and all gradations from bare "stone polygons" to an almost closed carpet with small patches of mud could be seen. This was brought about by centripetal colonisation of the polygons from the edges.

In his reply, Professor Gates stated that gradation in the size of trees was to be seen both latitudinally and altitudinally, but altitudinally there was rather a sharp break at the tree-line. There were few grasses, and hay was found only south of Kanalaksha. The forests were evidently being destroyed, partly by felling and partly by fires. The felling did not appear to be done in order to extend the Lichen bottom.

3rd February, 1927.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 20th January, 1927, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

The following were proposed as Fellows:—Alexander Francis Caddy; Wilfrid Robinson, D.Sc.; Richard Neville Parker; Geoffrey Tandy, B.A.; Roger Crompton Notcutt; William Reginald Chellar Paul.

The PRESIDENT announced that the President and Council of the Royal Microscopical Society had sent a cordial invitation to the Fellows of the Linnean Society to attend a Conference to be held at Liverpool on March 23rd, 24th, and 25th, 1927.

Dr. G. CLARIDGE DRUCE exhibited some interesting British Plants.

Botrychium rutaceum Sw. from Kincardineshire. This was detected by the exhibitor among a gathering made by T. R. Sim in 1876 and sent to the Rev. H. E. Fox, M.A., whose herbarium is now in the exhibitor's herbarium at Oxford.

In the account of the Dubious Plants of Britain which the exhibitor wrote for the Report of the Botanical Society and Exchange Club of the British Isles in 1919, it was mentioned that Dr. O. St. Brody said he gathered it at Stevenston in Ayrshire in 1887, and that there was a specimen in Herb. Mus. Brit. given by Mr. Whitwell. Therefore Sim's specimen is the earliest evidence of its occurrence as a British plant.

Senecio erraticus Bertoloni, from the New Forest, Hants, where it was detected by Mr. Colin Trapnell in 1923. Gay records it for the first time in the British Isles in 1852 (see B. E. C. 1919 Report, p. 771, 1920). Babington (Prim. Fl. Sarn. p. 53, 1839) mentions it from Jersey on the authority of La Gasca, and from marshes behind Ivy Castle, Guernsey; the latter is probably correctly named. In the Manual of 1847 he describes the large plant as var. *major* and queries it as *erraticus*, but in 1851 makes no reference to it. This was probably due to Leighton's Fl. Shropshire, p. 12, 1841, leaving out *aquaticus* and treating the Salopian plant as *erraticus*. But as his specimens show, they are *aquaticus*, not *erraticus*. In the Bot. Gaz. ii. p. 9, 1850, Babington states that he mistook the large form for *erraticus*, which he had not seen in Britain. The exhibitor visited the Hampshire locality in 1926 and found *erraticus* growing with *Jacobæa* and *aquaticus*, and both Dr. A. Thellung and Dr. J. Murr have confirmed the identification. Puzzling intermediate forms occurred. It may be remarked that Rouy (Fl. F. viii. p. 333) makes *S. Jacobæa* the main species, with *aquaticus* and *erraticus* as subspecies. *S. aquaticus* var. *ornatus* Druce, from the Shetland Isles, was also shown.

A new species of *Taraxacum* from Oxford and Tenby was shown which had recently (B. E. C. 1926 ined.) been described by Dahlstedt from specimens sent by the exhibitor. The Tenby one grew in damp spots in sand-dunes. It resembles *T. anglicum* and some other *palustria* species of the section, but belongs to the group *vulgaria* and has remained constant in cultivation for several years.

Another large flowered form, of the *spectabilia* group, from western Ross-shire and Oxford, has been described by Dahlstedt as *T. sublucescens*. The number of British Dandelions is now brought up to 83.

Orchis prætermissa Druce. The original specimens were shown as well as an example which Mr. B. S. Ogle of Steeple Aston succeeded in growing from seed and flowering, and also a seedling from the second generation which flowered this year in Oxfordshire, an unique example of a British Orchid being grown from seed for two generations. The progeny in essential features are identical with the grandparents. The species hybridises with *O. maculata*, *O. Fuchsii*, and *O. incarnata*. It is widely distributed through Britain and Ireland, but in the north usually is represented by var. *pulchella* Druce. *O. prætermissa* is found in France, Belgium, and Holland.

Mr. H. W. Pugsley suggested that Swedish plants of *O. prætermissa* were probably named *O. incarnata*. Dr. Druce considered this likely, as it had now been recorded from France, Belgium, Holland, and Denmark.

Mr. A. J. Wilmott said that there was a note on St. Brody's specimen of *Botrychium rutaceum* in the British Museum Herbarium, stating that he never collected or possessed a Continental specimen. The specific name *rutaceum* Swartz, used by British botanists should be replaced by *ramosum* Aschers., as it had been shown that Swartz knew only *B. Matricariæ* Spreng.

Professor C. E. Moss pointed out that many of the species of *Senecio* and *Taraxacum* were just as good as species described in the large herbaria from specimens from South Africa.

Mr. C. H. Wright said that the question of the occurrence of *Botrychium rutaceum* in Britain could not be definitely settled owing to the poverty of specimens. There were two distinct plants known as *rutaceum*—one of Willdenow, the other of Swartz; the former was now *B. ramosum* Aschers., the latter *B. Matricariæ* Spreng. As to the Sands of Barry plant, Newman, in the second edition of his 'British Ferns,' published Cruickshank's rather obscure drawing, but in the second edition substituted one from Alex. Braun which was certainly *B. ramosum*. The plant shown by Dr. Druce, although without the basal part, appeared to be *B. Matricariæ* Spreng.

Messrs. T. A. Dymes and W. C. Barton asked questions, to which the author briefly replied.

Dr. A. W. Hill, F.R.S., followed with a running commentary on a series of lantern-slides showing trees of western North America.

The President, Dr. G. C. Druce, and Messrs. I. H. Burkill and A. H. Maude, remarked on points of interest.

Professor C. E. Moss then gave an account of the Potamogetons of South Africa.

The President, Messrs. H. N. Ridley, A. J. Wilmott, Dr. G. C. Druce, C. H. Wright, and N. M. Mackenzie took part in a short discussion.

17th February, 1927.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 3rd February, 1927, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

Certificates were read for the second time in favour of the following candidates for Fellowship:—Alexander Francis Caddy; Wilfrid Robinson, D.Sc.; Richard Neville Parker; Geoffrey Tandy, B.A. (Oxon.); Roger Crompton Notcutt; William Reginald Chellar Paul.

Certificates were read for the first time in favour of:—Richard Eric Holttum, B.A. (Cantab.); John Gordon Dalgliesh; Eric Ashby, B.Sc., A.R.C.Sc.; William Bathgate Cranfield; Frederic Wilson Stansfield, M.D., D.P.H.; John Guy Dollman, B.A. (Cantab.).

Miss Eleanor Vachell gave an account, illustrated with coloured lantern-slides, of an unusual specimen of *Anagallis*.

The plant of *Anagallis* was noticed in a newly-constructed public park at Coldknap, Barry, Glamorgan, in July 1926, in a flower border about to be weeded, growing amongst a large colony of normal plants of *A. arvensis*. It had eleven stems—seven bearing scarlet flowers and four bearing blue flowers. Two types, *A. arvensis* Linn. and *A. fœmina* Mill., were apparently represented on the same plant, *i. e.*:—

Seven Stems.—Corolla-segments scarlet, edge even, fringed with numerous glandular hairs, calyx two-thirds as long as corolla.

Four Stems.—Corolla-segments blue, edge denticulate, with very few glandular hairs, calyx as long as corolla.

The root appeared normal, no fusion of two roots being visible. The interest of the specimen is that the characteristic features of two species (as usually recognized) are represented, but remain distinct. No parti-coloured flowers suggested hybrid origin: it appears rather that one portion of the plant may have reverted. The capsules on the seven stems bearing scarlet flowers were considerably in advance of those on the four stems bearing blue flowers.

Colour-slides (Paget Process) of the plant, taken by Capt. Morrey Salmon, and a diagram-slide giving the proportion of

glandular hairs on the two different calyx-segments were shown as well as the specimen itself.

The President read the following letter from the Rev. Canon F. W. Galpin on the subject of Miss Vachell's paper:—"With reference to Miss Vachell's interesting exhibit, I should like to state that, in the year 1924, a great quantity of *Anagallis fœmina*, together with an abundance of the common *A. arvensis*, was growing in a field near Rivenhall Place, Witham. My neighbour, Mrs. Bradhurst, who lives at The Place, and is a good field-botanist, observed a plant on which three stems bore red flowers and one stem blue. She transferred the plant to her garden, as the field was shortly coming under cultivation again; there I saw it, but unfortunately all the flowers had dropped. I am glad, however, that her find, which was somewhat doubted at the time, has now received ample corroboration.

"I may add that, after a prolonged search, I failed to find any similar specimen; nor did I observe any parti-colour hybridization between the two types."

In reply to the President, Miss Vachell stated that all the leaves of her plant were like those of *A. arvensis*.

Dr. Stapf suggested that Miss Vachell's plant was an instance of somatic segregation. He referred to Hoffman's experiments at Giessen and to Professor Weiss's, which showed a high constancy of colour and reluctance to cross. He paralleled the case of *A. arvensis* and *A. fœmina* by reference to *A. Monelli* (blue) and *A. collina* (red), which in their native areas are colour-constant. They are, however, to all appearance the parents of our garden pimpernels, of which seven colour-forms were known by 1839. He suggested that these two species should be subjected to genetic experiment, which might throw much light on the problem of our smaller wild pimpernels.

Mr. R. J. Chittenden referred to other examples, such as *Primula sinensis* and *Matthiola incana*, in which several characters are affected by a sport. The sport in these cases is due probably to somatic non-disjunction. The sporting *Anagallis* may be heterozygous for the various *fœmina* characters shown by the sport, and the *fœmina* characters being linked, the elimination of the homologous *arvensis* chromosome at a somatic cell-division would give a chimera of the type shown.

Mr. C. Leonard Huskins (Visitor) remarked that phenomena similar to the one described by Miss Vachell were known in wheat. Plants had been found bearing both *Triticum vulgare* heads and heads of the speltoid type, *i. e.* similar to *T. spelta*. Heads had also been found which were *vulgare* on one side and speltoid on the other. There was considerable evidence that this change was due to chromosome aberration. In species which had arisen by hybridization and subsequent polyploidy, it would seem that only a slight irregularity in cell-division was needed to upset the balance and permit the appearance of characters belonging to one of the original parental or other related species.

Mr. W. B. Turrill urged that further genetical experiments should be made with the blue and scarlet British pimpernels. He stated that there were other blue forms besides that usually recognized as *Anagallis fœmina* Mill., and certainly one in Great Britain, which had the corolla characteristics of *A. arvensis* except that the colour was blue.

Professor Julian S. Huxley read his paper, illustrated with diagrams, "On the Relation between Egg-weight and Body-weight in Birds," of which the following is an abstract:—

The analysis of Heinroth's data on the body-weight and egg-weight of 432 species of birds reveals certain points not brought out in his paper. He has shown that relative egg-weight decreases with increasing body-weight in all groups, but that the relative egg-weight differs from group to group.

For birds as a whole, the body-weights range from about 2 g. to 90 kg., the egg-weights from about 0·3 g. to over 1 kg. The relative egg-weight decreases from 12·2 to 1·8 per cent. as we pass from the class of lowest to that of highest body-weight. It is now shown that the relation between egg-weight (y) and body-weight (x) can best be expressed by an equation of the form $y=bx^k$, in which b is constant, but k gradually decreases with increasing body-weight.

The limiting value of k appears to be 1·0 for low body-weights. This would indicate that the egg would grow in linear proportion with body-weight if other factors did not intervene. For high body-weights k approaches $\frac{2}{3}$, indicating that egg-weight now increases proportionally to some surface.

The differences in relative egg-weight between different groups remain approximately constant throughout; but in the smaller members of a group of high mean body-size, relative egg-weight is increasing much more rapidly with increasing body-size than in birds of the same absolute size constituting the heavier members of a group of small mean body-size.

Thus each group, no matter if it contains no small or no large forms, has approximately the same form of curve; it is further possible that in some groups two curves are superposed (*e. g.*, one for ducks and one for swans within the Anseriformes).

Dr. G. P. Bidder expressed the indebtedness of the meeting to Professor Huxley for his interesting account of Heinroth's researches, but emphasised certain dangers in the free use of logarithmic paper. It had undoubted advantages where the data plotted on the logarithmic paper gave a straight line or where it was desired to test if they would give a straight line, but, if they did not do so, it required an accomplished mathematician to interpret the curve. It had also to be remembered that errors in the statistics were diminished in the logarithmic plotting, this smoothing increasing as the selected unit of measurement was diminished.

Mr. J. T. Cunningham and Major S. S. Flower referred to the

age of a bird as affecting the weight of the egg. Major Flower mentioned that in an Ostrich that he had investigated he had found a gradual decrease in egg-weight as the bird grew older. He referred to the disproportionately large egg of *Apteryx* as an instance opposite to that of the Cuckoo.

In reply, Professor Huxley stated that the range of variation was so great that the use of logarithmic paper was about the only possible way of dealing with it.

Mr. J. T. Cunningham gave a short communication, illustrated with lantern-slides, on "Natural Ambicoloration and the Production of Pigment by Light in Flat-fishes." Mr. Cunningham's remarks were a contribution to the discussion that followed the reading of Mr. J. R. Norman's paper on "Ambicoloration and Associated Variations in Flat-fishes" at the meeting of the 16th December, 1926, when Mr. Cunningham was not present. The following is an abstract:—

The association of a greater or less degree of symmetry in structural features, such as tubercles and scales, with ambicoloration in flat-fishes, especially the flounder and turbot, has been described by several authors. As regards the remarks made by Mr. Tate Regan and Mr. Norman in the discussion following the latter's paper, it should be noted that Mr. Cunningham's experiments were made on specimens of the flounder, in which the coloration is normally almost or quite uniform and dark. On plate No. 54 of the memoir published in Phil. Trans. Roy. Soc. (vol. 184. B. [1894] pp. 765–812) figures are given of the chromatophores from the skin of a normal flounder and from skin of the lower side of another specimen which had become pigmented under the influence of light. These figures proved that the nature of the pigment experimentally produced is the same as the natural pigmentation of the upper side. With reference to Dr. Calman's question, it was pointed out that there is no fleshy hook in the figure in the memoir mentioned of a specimen in which pigment had been experimentally produced. The usual hook-like projection of the end of the dorsal fin is shown in the figure—on another plate—of a naturally ambicolorate flounder. Mr. Cunningham did not attribute the coloration of the lower side in naturally ambicolorate specimens to the action of light. Ambicoloration in flat-fishes was evidently a mutation arising from some abnormal condition in the gametes and fertilised eggs, and not from any direct action of light. In support of this, Mr. Cunningham showed lantern slides of a peculiarly abnormal specimen of the turbot.

Mr. Norman regretted the misunderstanding which had occurred in his reference to Mr. Cunningham's work. He considered that two types of ambicoloration could be distinguished, and agreed with Mr. Cunningham that the ambicoloration occurring naturally could not be attributed to the action of light.

Dr. G. P. Bidder, Professor J. S. Huxley, and Dr. W. T. Calman also contributed to the discussion.

Owing to the unavoidable absence of the author, the paper by Dr. J. Davidson, "On the Occurrence of Intermediates in *Aphis rumicis* L., and their Relation to the Alate and Apterous Viviparous Females," was postponed to a future meeting.

3rd March, 1927.

Professor E. W. MacBride, F.R.S., Vice-President, in the Chair.

The Vice-President stated that the President was unable to be present owing to illness, and expressed the wish of the meeting for his speedy restoration to health.

The Proceedings of the previous General Meeting, held on Thursday the 17th February, 1927, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

Miss Isa. H. Martin, M.A., and Miss Leonora Jeffrey Rintoul were admitted Fellows.

Certificates were read for the second time in favour of:—Richard Eric Holttum, B.A.(Cantab.); John Gordon Dalgliesh; Eric Ashby, B.Sc., A.R.C.Sc.; William Bathgate Cranfield; Frederic Wilson Stansfield, M.D., D.P.H; John Guy Dollman, B.A.(Cantab.); and for the first time in favour of:—Walter Stiles, Professor of Botany, University of Reading; Francis Boothroyd, Myddle House, Hampton, Malpas, Cheshire.

The following were balloted for and elected Fellows:—Alexander Francis Caddy; Wilfrid Robinson, D.Sc.; Richard Neville Parker; Geoffrey Tandy, B.A.(Oxon.); Roger Crompton Notcutt; William Reginald Chellar Paul.

The Rev. H. Purefoy FitzGerald exhibited specimens of the Honey-Ant (*Camponotus inflatus*) of Western Australia. The honey is collected by the ants from the exudations of other insects and from galls, and is stored in specialized individuals which have the abdomen enormously distended.

Lt.-Col. J. H. Tull Walsh and Dr. W. T. Calman commented on the exhibit, and Mr. E. Step remarked that the Honey-Ant was described by Baldwin Spencer in his account of the Horn Expedition to Central Australia. It was known as "Yarumba" by the natives, who used it as food.

Mr. E. G. Baker exhibited fruits of *Cordyla africana* Lour., and illustrated his remarks with lantern-slides. The following is a summary :—

Cordyla africana Lour. is a tree with imparipinnate leaves. The flowers are in copious 6–12-flowered racemes, with a coriaceous calyx slit down in deltoid lobes about half-way, where the stamens are inserted. There are 30–35 stamens with free filaments and no petals. The pod is distinctly stalked, at first green, finally as large as a lemon, yellow and pulpy within, edible, several-seeded. The seeds have large fleshy cotyledons.

It is placed in the tribe Swartzieæ, the other African genera in the same tribe being *Swartzia*, *Mildbrædiodendron*, and *Baphiopsis*.

The Suborder Cæsalpinieæ differs from Papilionaceæ by the posterior petal being included in æstivation, and the radicle being straight. Bentham places the tribe Swartzieæ in the Papilionaceæ, but Harms places it in the Cæsalpinieæ. Some authors make it a separate Suborder, of equal rank with the Papilionaceæ and Cæsalpinieæ. When a plant has no petals one can decide its Suborder only by comparison with the æstivation of some closely-allied genus or by the embryo. In *Cordyla* the radicle is straight, as in Cæsalpinieæ, so we incline to Harms's view that it should be placed in the Cæsalpinieæ.

The nearest ally of *Cordyla* is *Mildbrædiodendron* Harms. *Baphiopsis*, also placed in this tribe, has 6 petals, a sessile ovary and simple leaves, and is very distinct.

Mr. H. N. Ridley suggested that the apparent gynophore in the fruit of *Cordyla africana* might turn out to be a suppressed part of the pod.

Mr. T. A. Sprague exhibited a series of photographs (taken in Virginia, U.S.A., by Dr. W. J. Humphreys) of ice-ribbons on *Cunila origanoides* Britton.

The photographs were presented to Kew by Dr. Rose, of the United States National Herbarium. They represent ribbons of ice which are formed on the dead stems of *Cunila origanoides* (*C. Mariana*), a perennial Labiate which grows on dry hills in the eastern United States from New York to Illinois, Arkansas, and Georgia. The ribbons are formed, not by external deposition, but by the exudation of water from the stem. According to Coblentz, the water rises in the vessels of the wood. The ribbons begin as a vertical row of hair-like ice crystals, which are soon bound together by a connecting web of ice. A fringe of ice is thus formed which gradually grows out into a ribbon. The ribbons are as thick as a table-knife, ½–2 inches broad, and may be 6 or 7 inches long.

From one to five (but usually two) ribbons may arise from the same stem. Similar formations have been observed on thistles and on species of *Pluchea*, *Heliotropium*, and *Helianthemum* (*vide*

Phil. Mag. 1833, ii. p. 110, t. 2, facing p. 82; Bot. Gaz. 1893, xviii. p. 183; Scientific Monthly, 1925, xxi. p. 511). The process appears to be a purely physical one.

Mr. H. N. Ridley mentioned that Foerste, in the 'Botanical Gazette,' had stated that the achenes of *Ambrosia trifida* in winter emit from the beak strands of ice, 1½–3 inches long, and the achenes are dispersed by wind, especially when they freeze to leaves or sticks that are blown away.

Mr. A. J. Wilmott gave an account of the Irish *Spiranthes*, called *S. Romanzoffiana* Cham., illustrating his remarks with specimens and lantern-slides.

There had been some suggestion that the plant from County Cork was not identical with that from Lough Neagh, and, hoping to settle the matter, Cork was visited last year and a successful attempt to rediscover the plant there was made. The same species was also seen in Kerry. A living specimen was taken north and compared with the northern form. The two plants are distinct in every character, the southern one being *S. gemmipara* Lindl. and the northern one *S. stricta* Rydberg.

Professor R. R. Gates stated that the North American *Spiranthes cernua* compared with the diploid *S. gracilis* and other related species was tetraploid, being apparently a cell giant. Both species had a similar distribution, and *S. cernua* appeared to be a recent mutation from a diploid species. Possibly there might be a similar difference between the two Irish forms described by Mr. Wilmott.

Mr. Francis Druce remarked that in only one of the two localities in County Cork, to which Mr. Wilmott and he had been directed, were they successful in finding *Spiranthes*. In that particular locality a fair number of plants in good flower was seen. The Kerry station produced only a few plants. The northern plant was plentiful in places about the northern end of Lough Neagh. He confirmed Mr. Wilmott's remarks with regard to the differences between the northern and southern plants.

Mr. H. W. Pugsley congratulated Mr. Wilmott on having added a new species of orchid to the British Flora without an additional name.

Mr. T. A. Dymes asked whether the two species of *Spiranthes* were more distinct than the forms of the Marsh orchids or of *Habenaria viridis*.

Mr. Wilmott, in reply, stated that, unlike the forms of the species referred to by Mr. Dymes, the Irish species of *Spiranthes* did not grow together.

Dr. J. Davidson read his paper, illustrated with lantern-slides, "On the Occurrence of Intermediates in *Aphis rumicis* L., and their Relation to the Alate and Apterous Viviparous Females."

In *Aphis rumicis* L. (Hemiptera, fam. Aphididæ) both alate and apterous viviparous females (virginoparæ) develop in the parthenogenetic generations. The alate virginoparæ tend to produce apterous v. females. The apterous virginoparæ may produce only apterous v. females or a mixed progeny consisting of apterous v. females and a variable percentage of alate v. females. From time to time individuals develop in the colonies which possess wing-rudiments and other features, which place them as intermediate between the apterous and winged condition.

Twenty-one of these intermediate forms were recorded in the colonies during rearing experiments with the above species. Three of these were described, and, with certain of the others, observations were made on the kind of offspring they produced. It was found that, in comparison with their immediate alate and apterous relations in the same generation, they behaved as apterous forms.

The observations indicate that the development of wings and associated structures is inhibited or suppressed in the apterous forms, while in the intermediates these features are partially developed.

Mr. A. W. R. Roberts mentioned that this peculiar condition of intermediateness seemed to be parallel with the intersexes in silk-worms, investigated by Goldschmidt. Possibly those intermediates were made up of greater or less percentages of the potentialities of the winged or the wingless viviparous females respectively.

Dr. W. T. Calman asked if the intermediates were to be regarded as essentially apterous individuals showing a tendency to wing-formation, or as essentially alate individuals with reduced wings. Dr. Davidson said that he was inclined to regard the apterous individuals as to some extent unstable, and liable, under certain conditions, to produce more or less completely winged progeny.

17th March, 1927.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 3rd March, 1927, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

Geoffrey Tandy, B.A., was admitted a Fellow.

Certificates were read for the second time in favour of the following candidates for Fellowship:—Professor Walter Stiles; Francis Boothroyd.

Certificates were read for the first time in favour of Miss Mary Agard Pocock, B.Sc., and James Lawrence Chaworth-Musters.

The following were balloted for and elected Fellows:—Richard Eric Holttum, B.A.; John Gordon Dalgliesh; Eric Ashby, B.Sc., A.R.C.Sc.; William Bathgate Cranfield; Frederic Wilson Stansfield, M.D., D.P.H.; John Guy Dollman, B.A.

The PRESIDENT announced a vacancy in the list of Foreign Members of the Society, in consequence of the death of Professor Ludwig Radlkofer.

The PRESIDENT showed an abnormal specimen of a Tulip flower which had been sent from Worthing by Mr. W. J. R. Deeks. One of the petals appeared to be pushed some distance down the peduncle, and consisted of a green central part with several red petaloid lateral lobes. Only five stamens were present.

The President expressed the thanks of the meeting to Mr. Deeks for giving the Fellows the opportunity of seeing the specimen.

Mr. R. I. POCOCK exhibited the skin of a remarkable new species of Cheetah recently described from Rhodesia.

Mr. M. A. C. Hinton remarked that the discovery of this beautifully striped species explained the reports which had reached him of the existence of a "tiger" in Rhodesia.

Sir Sidney Harmer congratulated Mr. Pocock on the discovery of this remarkable and striking species.

Mr. D. J. Scourfield remarked that the two species of Cheetah recalled in their colour-patterns the two forms of the domestic cat, formerly described by Mr. Pocock as the blotched and striped tabby.

Mr. E. M. MARSDEN-JONES and Mr. W. B. TURRILL gave an account of an improved herbarium method for geneticists, ecologists, and taxonomists. The method demonstrated originated, so far as the exhibitors were concerned, with Professor W. G. Craib, of Aberdeen. It has been used at Kew for some years, and, with minor modifications, is capable of very wide application. With the hope that ecologists and geneticists especially would recognize the necessity of keeping as records the actual specimens with which they have worked, some examples of the results of the method were submitted. Briefly, the process is the sticking-down of the specimens in the living condition. The best results have been obtained with paste, not with gum or glue, "Gloy" being the best so far tested. A sheet of paper or card is brushed over with a thin layer of the paste, and the specimens placed on this. They are dabbed down and excess of paste wiped away. The sheet is then placed in a press and considerable pressure applied. It is advisable to look at the

preparations within a few hours, and remove any excess paste. After a few days the specimens are dried; they retain their shape, and sometimes their colour, indefinitely. The most useful results are obtained with dissected flowers and inflorescences; all parts of the flower can be shown with upper and lower surfaces visible, and sections can also be stuck down for drying in position. With some plants, ironing through blotting-paper with a hot iron gives excellent results. For taxonomy the need for boiling and dissecting is practically eliminated when series like those shown are available. In such a family as Zingiberaceæ and in such a genus as *Iris*, without a method like this, herbarium work is largely hopeless. In genetical studies it has been found most valuable, not only in making ordinary herbarium specimens of entire plants for future reference, but also in having series showing various floral and other organs on cards. In work on *Geum*, herbarium sheets of the distinct forms resulting from the crossing of the British species were prepared, and on cards complete sets of the petals and calyces of all plants raised were kept. A herbarium prepared in this way would become more and more valuable, for no experimental ground is large enough to keep growing all the plants which have been worked with; but with the above plan a record is preserved. The importance of an ecological herbarium would also be enhanced by adoption of the method or a modification of it.

In reply to questions by the President and Dr. A. W. Hill, Mr. Turrill explained that in fleshy specimens the flowers would be treated apart from the vegetative parts, and that there was practically no shrinkage of the parts treated.

Dr. Stapf warmly supported the plea for careful preparation of flowers and other delicate parts on the lines described. He pointed out the great advantage of such preparations in any investigations where it was important to repeat experimental work with material, the specific identity of which with the original should be above suspicion.

The President referred to the specimens of *Iris* prepared by the late Mr. Dykes, and Mr. H. N. Ridley mentioned Mr. Maw's *Crocus* specimens as comparable with the exhibits before the meeting, and touched upon the limitations of the method and the difficulties likely to be encountered under the usual conditions of collecting in the tropics.

Miss F. Haworth (Visitor) gave an account of her investigations into dyes obtained from Lichens, and exhibited a collection of the Lichens used and of materials woven and dyed by herself. There are two kinds of dyes, those needing a mordant (adjective dye) and those which only need boiling (substantive). In the first type, different effects are produced by the use of different mordants, *e.g.* tin brightens the colour, whereas iron deadens it.

Lichens used as dyes by the Highland crofters are called "crottles." Many of them are substantive, but a better effect is secured by mordanting.

Parmelia saxatilis (gathered preferably after a wet day) and *P. omphalodes* are used in the preparation of Harris tweed, and give a characteristic smell to the cloth. Three methods of dyeing are used:—(1) Boiling the lichen and wool together; (2) soaking in ammonia for a week; (3) the method used by the crofters, which consists in boiling with ammonia for about two hours until mucilaginous, folding dye and cloth alternately and covering with rain water with a little alum, boiling for twenty minutes, and then washing the cloth in cold water.

Xanthoria parietina gives a yellow or orange colour (with potassium bichromate a plum colour); *Parmelia caperata* gives lemon-yellow; *Lobaria pulmonaria* is used by Herefordshire peasants to dye stockings brown. *Usnea barbata* dyes orange. *Lecanora tartarea* gives a red dye; it is steeped with ammonia for a week until of a stiff consistency, then taken in blocks of ¾ lb. weight, wrapped in dock leaves, and hung from the cottage beams to dry in the peat smoke; it may be stored in this way for a considerable time.

It may be stated generally that the best results are obtained where numerous soredia are present. The power of producing these plentifully is possibly connected in some way with the dye-yielding property. Rock-lichens give the best dyes, those species with a large flat thallus rarely producing a permanent dye, though *Peltigera canina* gives a yellow colour with cotton.

Miss Lorrain Smith remarked on the difference of colour obtained from *Parmelia saxatilis* under different conditions, and referred to the manufacture of cudbear from *Lecanora tartarea*.

Mr. J. C. Shenstone, in the course of remarks on the permanence of dyes, referred to the importance of iron as a mordant in the dye known as ink. He stated that faded inks that had contained iron could easily be restored even after the lapse of ages. The lack of iron in the composition of some modern inks was likely to bring about the ultimate loss of historical and other valuable documents.

Mr. R. Paulson referred to the different dye-properties of soredial and non-soredial lichens.

The President congratulated Miss Haworth on the interest of her paper and exhibits.

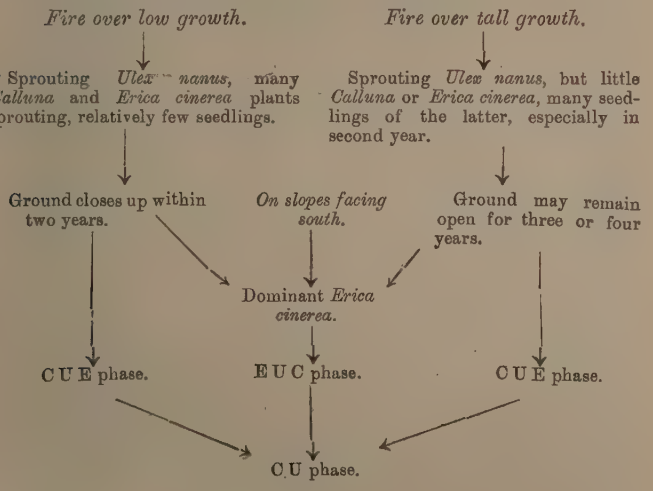
Professor F. E. Fritch described, with the aid of a series of lantern-slides, his investigations of the Heath-Association on Hindhead Common.

The purpose of the communication was to explain the diverse character of the vegetation on different parts of the heath and the mode of recovery after fires. Except along the pathways and on newly-burnt ground the vegetation consists almost solely of *Calluna vulgaris*, *Erica cinerea*, *E. Tetralix*, *Vaccinium Myrtillus*,

Pteridium aquilinum, *Ulex nanus*, *Molinia caerulea*, and *Deschampsia flexuosa*, but the relative grouping of these different species varies considerably with the length of the period that has elapsed since the last fire, with the aspect, and with soil-features. The character of the vegetation in the first years following upon a fire depends upon the size of the growth that was burned, but ultimately it always passes over to a phase in which *Calluna* is completely dominant and more or less completely hides the co-dominant, but largely prostrate, *Ulex nanus*. On slopes facing south *Erica cinerea* may become a temporary dominant for some years, owing to the dying away of large numbers of the young *Calluna* plants.

An outstanding fact is the stationary character of the vegetation. Fires cause little ultimate change and, after a number of years have elapsed, the heath presents the same appearance and detailed composition as before. Plants like *Pteridium* and *Molinia* may exhibit a limited increase of area in the first years after a fire, but do not advance after the vegetation has closed up. In illustration of these facts, maps were shown representing the same ground at intervals prior to, and some years subsequent to, a fire.

The following is a summary of the succession:—


Fire over low growth.
Fire over tall growth.
Sprouting Ulex nanus, many Calluna and Erica cinerea plants sprouting, relatively few seedlings.
Sprouting Ulex nanus, but little Calluna or Erica cinerea, many seedlings of the latter, especially in second year.
Ground closes up within two years.
On slopes facing south.
Ground may remain open for three or four years.
Dominant Erica cinerea.
C U E phase.
E U C phase.
C U E phase.
C U phase.

C = *Calluna*; E = *Erica*; U = *Ulex*.

Dr. E. J. Salisbury called attention to the chief interest of the successions on Hindhead in the contrast they offered to the fire-successions on other areas. On the gravel-heaths of Hertfordshire, fires had brought about a marked and permanent increase of Bracken, and indeed some heaths, which were formerly

dominated by *Ulex*, had now, owing to repeated fires, become Bracken heaths. The other striking difference was the minor rôle played by grasses in the early stages of the succession after burning at Hindhead, whereas on the Yorkshire "swiddens," on the heaths of Hertfordshire and elsewhere, grasses were an important feature of the early stages, *Holcus lanatus* and *H. mollis* being usually conspicuous species.

Mr. A. J. Wilmott contrasted the fire-areas on Wimbledon Common, where high winds removed the burnt peat, leaving tracts of bare sand, on which recovery was very slow.

Mr. T. A. Sprague observed that in his experience on the Quantock Hills and Grabbist Hill, Somerset, the Dodder attacked *Ulex Gallii*, on which it was especially abundant, *Calluna*, *Erica cinerea*, and *E. Tetralix*. It germinated but did not succeed very well on *Vaccinium Myrtillus*. It was very rare on Bracken and grasses, and the stems seemed to have passed to these from other plants. Although haustoria were produced on Bracken and grasses, it was doubtful whether these actually penetrated the tissues.

Mr. B. Barnes remarked that examination of a number of Dodder-infested specimens of Bracken on Marley Common in August 1926 led to the conclusion that, although the stems of the parasite had encircled the petiole of the Bracken, penetration had not taken place, and the petiole was not even marked.

Mr. T. A. Dymes expressed the opinion that the failure of *Cuscuta* to establish itself on the dense formation of *Calluna* and *Erica* might be due to the exclusion of light from the soil. The Dodder seedling was an unbranched thread that died away at the base as it elongated at the apex. It was, however, chlorophyllous, and in the absence of light would be unable to grow, and would perish before reaching the host.

Mr. R. Paulson asked whether the fires on Hindhead Common occurred all at the end of summer, and whether fires occurring at a different season would have a different effect.

Mr. I. A. Williams stated that in his experience *Molinia* was the first species to spread after a fire, and expressed the belief that fires led to the spread of *Epilobium angustifolium*, and were responsible for the disappearance of some annuals.

In his reply, Professor Fritch agreed that the succession on Hindhead differed from that in other parts of the country. Fires occurred at any season. While *Epilobium* might be abundant in the early stages after a fire, it was usually smothered out later on by the dense growth of the dominant species.

7th April, 1927.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 17th March, 1927, having been circulated, were taken as read and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

The following were admitted Fellows:—Eric Ashby; Ernest St. John Burton; Alexander Francis Caddy; John Gordon Dalgliesh; David Paul; Frederic Wilson Stansfield.

Certificates were read in favour of the following candidates for Fellowship:—Miss Mary Agard Pocock, B.Sc., and James Lawrence Chaworth-Musters, for the second time; and The Hon. Henry Duncan McLaren for the first time.

The following were balloted for and elected Fellows:—Professor Walter Stiles, Sc.D.; Francis Boothroyd.

The following Fellows were elected as Members of the Audit Committee:—Mr. E. A. Bunyard and Mr. R. Cory to represent the Council; Mr. E. T. Browne and Mr. R. Paulson to represent the Fellows.

The PRESIDENT announced that the Linnean Medal had been awarded to Dr. OTTO STAPF, Ph.D., F.R.S., and the Crisp Award and Medal to Professor HERBERT GRAHAM CANNON, M.A., D.Sc.

Mr. C. TATE REGAN exhibited models and drawings of Oceanic Angler Fishes. These live in mid-water, from two or three hundred to a thousand fathoms below the surface, where there is little or no light. They are uniformly blackish in colour and attract their prey by a luminous lure. The males are dwarfed and parasitic on the females, this peculiarity being presumably related to the difficulty that slow-swimming fishes, leading a solitary life in darkness, would have in finding a mate. (See Dana Expedition, Ceratioidea, Copenhagen, 1926.)

Dr. G. P. Bidder, Lt.-Col. J. H. Tull Walsh, and the President referred to the great interest of the exhibit.

Mr. G. C. ROBSON (Visitor) exhibited preparations and lantern-slides illustrating bacterical luminescence in Cephalopoda.

In 1907 W. T. Meyer described some remarkable luminous organs situated on the ink-sac in a small Mediterranean Cuttlefish, *Sepiola rondeletii*. In a series of papers (1918–22) U. Pierantoni has redescribed these structures and similar light-organs in other Cephalopods. He attributes the luminous substance produced by these animals not to the secretory activity of the light-organs themselves, but to masses of symbiotic bacteria lying below the lens of the light-organ. This theory and its application by Pierantoni to the origin of luminescence in other animals were criticised on various grounds.

Mr. Ramsbottom pointed out the general interest of the phenomenon of luminescence. Amongst plants, bacteria, fungi,

and Peridineæ, all non-chlorophyllous, are well-known as showing examples. Luminous bacteria commonly occur on putrefying fish, meat, and such like, and about thirty species have been described. Pierantoni and Buchner have been led to a belief in bacteria being the source of light in various animals by the study of the symbiotic yeasts—*e. g.*, in the larvæ of Aphids.

Amongst fungi the phenomenon is seen in many species of *Pleurotus*, both sporophore and mycelium usually being luminous. None of these species have been recorded for this country. Luminous wood is common, but it is due to the mycelium and young rhizomorphs of *Armillaria mellea*. It is of interest to note that there is sometimes unanimity about the luminosity of a given fungus, e. g., *Armillaria mellea* and the American Jack o' Lantern (*Clitocybe olearia* = *C. illudens*). At other times there are conflicting statements, *e. g.*, about *Xylaria hypoxylon* and *Panus stipticus*. Buller has recently shown that the American forms of *P. stipticus* are luminous, whereas those of Europe are non-luminous. Another point of interest is that decaying leaves on the ground in woods frequently emit light, presumably on account of the presence of fungal hyphæ.

Dr. G. P. Bidder referred to Mr. C. F. Hickling's investigations of luminescence in fishes, described in the Journ. Marine Biol. Assoc. xiv. No. 2 (1926).

Dr. W. T. Calman called attention to the fact that the production of light in many animals, both terrestrial and aquatic, was due to the interaction of two substances—luciferin and luciferase.

Professor J. Percival gave an account, illustrated with lantern-slides, of the species and races of Wheat and their relationships. No abstract was provided.

The President, Mr. T. B. Blow, Mr. E. J. Collins, Mr. C. C. Lacaita, and Mr. G. C. Robson commented on some of the points raised.

28th April, 1927.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 7th April, 1927, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

The following were admitted Fellows:—William Bathgate Cranfield; Miss Evelyn Vida Baxter.

The PRESIDENT announced the deaths of the following Foreign Members :—Charles Sprague Sargent, on the 23rd March, 1927, and Georg Ossian Sars, on the 9th April, 1927.

Certificates were read in favour of the following candidates for Fellowship :—The Hon. Henry Duncan McLaren for the second time ; Edward Clement, James Edgar Dandy, Sunda Lal Hora, Kenneth Kent Mackenzie, and Frederick Augustus Secrett for the first time.

The following were balloted for and elected Fellows :—Miss Mary Agard Pocock, B.Sc.(Lond.), and James Lawrence Chaworth-Musters.

The PRESIDENT exhibited specimens of flowers of Primrose showing phyllody of the calyx which he had received from Mr. G. W. Willis, Basingstoke. The sepals were enlarged and leaf-like with a somewhat wrinkled surface ; the corolla was very poorly developed and inconspicuous.

The PRESIDENT also called attention to an interesting specimen of *Aconitum anglicum*, which had been placed on the table by Dr. O. Stapf.

Dr. E. J. SALISBURY exhibited a fragment of Beech-bark, which showed an unusual growth of a filamentous alga.

The BOTANICAL SECRETARY drew attention to a striking Maize plant which had been sent by Mr. R. E. C. Beale from Messrs. James Carter & Co.'s establishment at Raynes Park. In the plant exhibited the places of several of the flowers on the male inflorescence were occupied by solitary female flowers, each with a fully-developed ovary, style, and stigma. In his letter accompanying the plant Mr. Beale stated that about 75 per cent. of a group of Maize plants in cultivation at Raynes Park showed this replacement of male by female flowers in the male inflorescence.

The President commented on the great interest of the exhibit, but, owing to the full programme, time for discussing it was not available.

The BOTANICAL SECRETARY read a letter from Mr. Fred Turner, F.L.S., of Sydney, New South Wales, enclosing a copy of Act No. 2, 1927, of the New South Wales legislature, to provide for the protection of Wild Flowers and Native Plants. Mr. Turner by his writings in the Press of New South Wales had played an important part in stimulating protective measures for the native flora, and the President expressed on behalf of the Fellows present their appreciation of his efforts and results.

Miss M. A. Pocock gave an account of her journey from the Zambesi westwards across Angola. Her description was illustrated by a large series of beautiful lantern-slides, many of which were coloured, showing the topography, the vegetation, and individual plants of the region traversed.

The President expressed the Fellows' appreciation of Miss Pocock's very interesting account, but owing to lack of time no discussion of it was possible.

Dr. Hugh Scott (Visitor) gave an account of his recent travels which were undertaken to examine the insect fauna and, as far as possible, the flora of the highlands of central Abyssinia. The fauna and flora are of peculiar interest in that they are those of a large, well-watered, elevated country in the heart of Africa, isolated from surrounding regions by low-lying desert or semi-desert tracts; and that they exhibit a remarkable blend of Palæarctic, Ethiopian, and Oriental elements. No systematic collecting of small insects had previously been done in this part of Abyssinia. The Expedition set out from Addis Ababa, the capital, at over 8000 feet above sea-level, and, by trekking with a mule caravan and camping during many weeks, several very different types of country, lying at elevations between 5500 and 12,000 feet, were visited. These included the primeval forest of Djem-Djem, composed mainly of giant juniper-trees; Mount Zuquála, an extinct volcano with a lake in its crater, and covered with giant heath and other interesting vegetation; the plains southwards to Lake Zwai, a region of dry bush and thorn-scrub; the park-like country, forest, and heath-land of Mount Chillálo; and the Muger Valley, a great chasm more than 2000 feet deep, with precipitous sides. The lantern-slides shown illustrated the different kinds of country and vegetation (especially the curious mixture of temperate and distinctly African plants frequently met with), as well as some aspects of the human life of Abyssinia.

Owing to lack of time there was no discussion, but appreciatory remarks on the great interest of Dr. Scott's paper and on his work in Abyssinia were made by the President, Mr. C. F. Rey (Visitor), Mr. J. C. Waller, Dr. O. Stapf, and Major S. S. Flower.

Mr. W. P. Pycraft exhibited a restoration of the left innominate bone of Rhodesian man. The following is a summary of Mr. Pycraft's remarks:—

The restoration is based on the greater part of the left ilium. That portion of the ilium forming the outer wall of the "false pelvis" is remarkable for its great height and the quite unusual position of the greater sciatic notch.

But the most important feature of this fragment is the acetabulum, which is remarkable for its smallness and extreme

shallowness, as well as for the form of its articular surface. What answers to the lower segment of the horse-shoe loop in modern pelves—which terminates immediately below the free end of the upper loop—is, in this pelvis, splayed out backwards so as to cause the acetabulum to look backwards and downwards, instead of forwards and outwards as in modern man.

The position of the ischium and pubis is markedly different from that of modern pelves. The long axis of the ischium must have lain parallel with a line running from the antero-superior to the postero-inferior spine of the ilium, instead of nearly at right angles thereto. Furthermore, the backward torsion of the acetabulum must be regarded as having forced the ischium backwards, towards the middle line, wherein it contrasts with the position in modern pelves, where the ischium and pubes stand at about right angles to the plane of the ilium.

A complete description will appear in an account of the remains shortly to be published by the Trustees of the British Museum.

Sir Arthur Keith (Visitor) said he had listened to Mr. Pycraft's statement with interest and close attention, but, as regards his contention that Rhodesian man should be given a separate generic status, he had come to the conclusion that Mr. Pycraft had failed to make out his case. Two years ago Sir Arthur Smith Woodward had given the speaker the freest opportunities of making a detailed examination of all the fossil parts of Rhodesian man, and he had then come to the conclusion that Sir Arthur Smith Woodward, in giving Rhodesian man the status of a separate species, had gone to the limit of what was justifiable in the present state of knowledge. One must remember that the standard which has been set and accepted by anthropologists—namely, to regard the most marked races of modern mankind as mere varieties or subspecies of *Homo sapiens*—determines for us a scale of classification. We had also agreed to regard Neanderthal man as a species; now the difference between Neanderthal man and the most primitive of modern races—the Australian aborigines—was (in the speaker's opinion) greater than that between Rhodesian man and the Australian aborigine, and that therefore any attempt to alter the specific status of Rhodesian man was to upset our accepted scale of classification.

Before touching on the new points brought forward by Mr. Pycraft—and all of them were hypothetical points,—it would be well to turn for a moment to our certain knowledge of this strange form of fossil man. The tibia showed not any approach to the anthropoid type; it might be described as ultra-human; no bone could proclaim more emphatically that its owner was upright in the fullest sense of the term as applied to modern man. The fragments of the thigh-bone were also unequivocal in their form and characters; in every sense they were parts of a man completely adapted to the upright posture. The head of the femur was large (49 mm. in diameter), and one must infer that the joint-cavity of the hip-bone was shaped so as to receive it.

Then the sacrum showed all the features of the human bone—it was more flattened in an antero-posterior direction than prevails in modern man, but the joint-surfaces which received the hip-bone were absolutely human in shape and size, and we must infer that all strains and stresses were transmitted from the femur to the spinal column just as they are in modern man.

It was therefore very unexpected to find that the hip-bone (os innominatum) of Rhodesian man possessed such peculiar and extraordinary characters as had been described by Mr. Pycraft and represented in his reconstruction. To explain these characters, it was easier to suppose that Mr. Pycraft was mistaken in his reconstruction than that such a hip-bone had ever existed in the body of a being otherwise human. Although he had seen Mr. Pycraft's reconstruction only at a distance, and it was therefore rash to be too dogmatic, yet he had seen enough to feel confident a grave error had been made in the reconstruction of the hip-bone. (The reconstruction was handed to the speaker for closer examination.) A close examination confirmed him in this opinion; almost a whole element has been excluded from the acetabular cavity—the element contributed by the ischium. As this was a dominant element in the acetabular cavity of all the higher Primates, it was most improbable that it was missing in Rhodesian man. It was the speaker's deliberate opinion that, when this element was restored and the bone reconstructed according to the suggestions given by the preserved part, the hip-bone of Rhodesian man would be found to differ from the corresponding bone of modern man only in a number of small and not significant features.

Mr. R. H. Burne agreed with Sir Arthur Keith that Mr. Pycraft was not justified in his opinion that the fragment indicated a distinct genus of Hominidæ. Mr. M. A. C. Hinton, on the other hand, supported Mr. Pycraft. Dr. W. T. Calman thought the question of the exact taxonomic status to be attributed to Rhodesian man was of minor importance. He believed that closer examination would convince Sir Arthur Keith that Mr. Pycraft's restoration had been made with great skill and commendable caution, and that the pelvis differed widely from that of modern man.

Mr. Pycraft, in reply, maintained the essential accuracy of his reconstruction.

12th May, 1927.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Proceedings of the previous General Meeting, held on Thursday the 28th April, 1927, having been circulated, were taken as read, and confirmed.

A list of the more important donations received since the last meeting was read and laid on the table.

Francis Boothroyd and Walter Stiles were admitted Fellows.

Certificates were read in favour of the following candidates for Fellowship :—Edward Clement, James Edgar Dandy, Sunda Lal Hora, Kenneth Kent Mackenzie, and Frederick Augustus Secrett for the second time ; Miss Eugenie Sachs, Percy George Netley, Henry James Howard and Lewis Guy Peirson for the first time.

The Hon. Henry Duncan McLaren was balloted for and elected a Fellow.

The President reminded the Fellows and Associates present of the Anniversary Dinner to be held at the Criterion Restaurant on the 24th of May.

The President read a letter from Mr. W. Coldstream, formerly of the Indian Civil Service, giving growth-measurements of several specimens of *Eucalyptus tereticornis* Sm. planted by him in various parts of the Punjab fifty years ago.

The Botanical Secretary exhibited, on behalf of Dr. W. Watson, A.L.S., some abnormal specimens of the Greater Stitchwort (*Stellaria Holostea* L.) collected at Milverton, W. Somerset, in 1925 and 1927. All the flowers were green, and any stamens or carpels present showed leaf-like characters. Many of the flowers consisted merely of sepal-like bodies, with buds in their axils.

The three carpels, instead of being joined, were separate and showed transitions to sepal-like bodies.

The Botanical Secretary also showed several copies of the 'The Balkan News' of 1918, the paper published for H.M Salonica Forces, containing articles on the collection of plants in Macedonia and on the competitions organised for fostering the interest of the troops in the vegetation of that country.

Mr. James Groves read his paper on a collection of Charophyta from Madagascar made by Mr. T. B. Blow.

Early in 1924 Mr. T. B. Blow paid a visit to Madagascar, with a view to obtaining specimens of Charophyta, and got together a fine and extensive collection, running to over a hundred numbers. Many of these were exhibited at the meeting of the Society on the 19th June, 1924. The present paper was an enumeration of the species, so far as it has been found possible to work them out, with descriptions of those regarded as new. Seven species of *Chara* were collected, all belonging to known and fairly distinct types. The representatives of the more intricate genus *Nitella* had proved difficult to discriminate, many closely-allied forms

being present. The new species described were probably mostly endemic to the island. None of the smaller genera were represented in the collection.

The President commented on the success with which Mr. Groves had secured the interest of the meeting in his presentation of a purely taxonomic paper. Mr. T. B. Blow referred to the curious species of Chara, which weighed a few ounces when fresh and a few grains when dry.

Mr. T. B. Blow read the following account of his observations on the alleged larvicidal properties of Charophyta :—

I. My objects in visiting Madagascar were :

(*a*) To investigate under tropical and malarial conditions the alleged larvicidal properties of Charophyta.

(*b*) To make a general investigation of the Charophyte-flora of the northern half of the island, Madagascar botanists having previously hardly touched these plants. The results obtained form the subject of a taxonomic paper by Mr. James Groves.

II. As my time in the island was limited to two months, I decided to confine my investigations to the northern half, working round the ports of Majunga, Nosy-Be, Diego Suarez, and Tamative. Three weeks were spent around the capital, Tananarive, as railways and roads were there available, and the remainder in remote parts where there were only paths and tracks, and where one had to be conveyed in Filanjana (a chair on poles carried on men's shoulders, requiring, with two luggage porters, in all eight men). This vast island has only three million inhabitants, and therefore, unless one had official help, labour was very difficult to obtain. Every assistance was given by the French authorities, from the Governor-General himself down to the local French and Native Administrators. I was also greatly indebted for hospitality and assistance to the few English missionaries who are scattered in remote districts. Without their friendly help I should have fared badly in a country practically without hotels. In the capital the possible larvicidal properties of the Charophytes created great interest. A meeting of the Academy of Madagascar was called, and I gave an address on the subject, suggesting that certain experiments should be made locally to test the validity of Caballero's theory. Owing to the unavoidable departure from the capital of the three most interested persons, however, I believe the experiments have not been carried out.

I have seen certain waters in which Charophyta grew abundantly and which were quite free from mosquito larvæ. There were other large pieces of water, however, in which Charophyta were quite absent whilst mosquito larvæ abounded. From these facts it might have been inferred that the Charophytes did possess some larvicidal property. The experiments detailed below,

however, show that some other substance in the waters giving them the larvicidal qualities must be sought for.

On the 19th June, 1924, I communicated to the Society some observations I had recently made in Madagascar in connection with the supposed larvicidal qualities of Charophytes, and promised that when certain further experiments had been carried out I would communicate the results.

These experiments consisted in cultivating in large glass jars a number of species of Charophyta, then introducing mosquito larvæ and noting the results; also in obtaining the glucoside from dried *Chara zeylanica* (a large quantity of which I had bought from Madagascar), and observing the effect of a dilute solution on mosquito larvæ.

Chara vulgaris and *Chara hispida* had already been experimented with at Wisley with quite negative results. I therefore chose for my experiments:—*Chara desmacantha*, *Chara macropogon*, *Chara delicatula*, *Chara contraria*, *Laprothamnium papulosum*, *Nitella opaca*.

Plants of all these had been kindly furnished me by Mr. James Groves.

I much wished to have experimented with living plants of *Chara zeylanica*, but failed in my attempts to cultivate that species.

The larvæ were of: *Culex pipiens*, *Theobaldia annulata*, *Anopheles maculipennis*.

In every case the larvæ enjoyed a vigorous life, and a very large percentage attained to the winged insect.

Extracts containing the glucoside were prepared by Dr. Henry, and used by Mr. MacGregor at Wisley with the same negative results.

Mr. F. J. Hanbury kindly placed the services of his chief chemist, Mr. Norman Evers, at my disposal, and from the extract containing the glucoside with which he furnished me, when used in dilute solution 1–200, the larvæ were not troubled in the slightest degree.

Part of this extract was sent to Mr. F. J. Marshall, of the British Mosquito Control Institute, and with 1–200 solution he got exactly the same negative results.

The conclusion I have arrived at is that Charophyta do not possess any larvicidal qualities, and therefore that where larvæ cannot live and Charophytes abound, some other cause for the larvicidal character of the water must be sought for to give these waters their larvicidal qualities. Mr. Norman Evers found that when making the extract from *Chara zeylanica* the plant contained large quantities of potassium chloride, and he wished that he had some of this particular pond-water for analysis.

My experiments have extended over nearly a year, and I think the negative results obtained may be regarded as quite conclusive.

I desire to acknowledge the great and willing help that I have received from Doctors Wenyon and Henry and Mr. MacGregor, all of the Welcome Research Laboratories, and from Mr. Evers, of Messrs. Allan & Hanbury, and Mr. Marshall.

Mr. V. S. SUMMERHAYES read a paper by Mr. T. A. Sprague and himself on "The Geographical Distribution of some Santalaceæ." The following is an abstract of the paper:—

An investigation by the authors into the taxonomic status of the Australasian genus commonly known as *Fusanus* "R. Br." (non Murr.) led to its being divided into two genera—*Eucarya* T. L. Mitch. (Australia) and *Mida* A. Cunn. (New Zealand). It was then discovered that the now extinct *Santalum fernandezianum* F. Phil. (Juan Fernandez) should be transferred to the genus *Mida*. The diagnostic characters of *Santalum*, *Mida*, and *Eucarya* are as follows:—

Santalum.—Perianth-tube long, disc-lobes tongue-like, ovary semi-inferior, style long.

Mida.—Perianth-tube shortly cupular, disc-lobes either very short and broad or subquadrate, ovary semi-inferior, style none.

Eucarya.—Perianth-tube patelliform, disc-lobes very short and broad, ovary inferior, style very short or none.

The distribution of *Mida* is of exceptional interest, one species occurring in New Zealand (North Island) and the other in Juan Fernandez. If the genus *Mida* is monophyletic, the distribution New Zealand–Juan Fernandez may perhaps best be interpreted as an extreme example of the well-known New Zealand–Chile (or South America) type, exemplified by such genera as *Calceolaria* (*Jovellana*), *Fuchsia*, *Aristotelia*, etc., which is generally explained as the result of northward migration from the Antarctic Continent. On this hypothesis *Mida* may be supposed to have occurred formerly in the South Island of New Zealand and on the mainland of Chile, and to have become extinct there. It seems possible, however, that *Mida* may have had a diphyletic origin from *Santalum*, the ancestors of the New Zealand species having migrated from Australia and those of the Juan Fernandez one from Hawaii.

The geographical distribution of *Santalum album* affords a problem of a different nature. *S. album* is known only from (1) Southern India and (2) the eastern part of the Malay Archipelago, from Eastern Java to Timor. This discontinuity may conceivably be due to extirpation by disease in the intervening area. According to C. Gay (Fl. Chil. v. p. 326, 1846), all the trees of the Juan Fernandez sandal-wood died from some disease in a single year, and the same thing may have happened in Western Malaya. A second hypothesis—that the species was introduced into India from Eastern Malaya—is brought forward by Mr. C. E. C. Fischer. In his experience in Coimbatore and Mysore the tree occurs only in the vicinity of existing villages or abandoned village-sites. Further, there is evidence that the area in Madras occupied by *S. album* has increased very greatly during the past century. Thirdly, historical evidence exists that the greater part of and the best sandal-wood in the 16th century

came from Timor and adjacent islands. And, finally, if *S. album* is indigenous in India, it is so in the drier tracts of Mysore; yet it is better grown and more vigorous in the damper parts, which is what might be expected if the tree came originally from the Malay Archipelago.

Captain F. Kingdon Ward (Visitor) gave an account, illustrated with many beautiful lantern-slides, of the Sino-Himalayan region and its Flora. (See pp. 67–74.)

The following papers were read in title only:—

Dr. B. M. Griffiths. Studies in the Phytoplankton of the Lowland Waters of Great Britain. No. 5. The Phytoplankton of some Norfolk Broads.

Mr. C. S. Hanes. Resin Canals in Seedling Conifers. (Communicated by Professor A. C. Seward, F.R.S.)

24th May, 1927.

Anniversary Meeting.

Dr. A. B. Rendle, F.R.S., President,
in the Chair.

The Minutes of the previous General Meeting, held on the 12th May, 1927, having been circulated, were taken as read, and confirmed.

The Assistant Secretary read a list of the donations received since the previous meeting.

The following were admitted Fellows:—Richard Eric Holttum; William Reginald Chellar Paul; Wilfred Norman Edwards; Frank Cornish.

Certificates of recommendation for Fellowship were read in favour of the following Candidates:—Miss Eugenie Sachs, Percy George Netley, Henry James Howard, and Lewis Guy Peirson for the second time; Miss Mary Dilys Glynne and Raymond Henry Stoughton for the first time.

The following Candidates were balloted for and elected as Fellows:—Edward Clement; James Edgar Dandy; Sunda Lal Hora; Kenneth K. Mackenzie; Frederick Augustus Secrett.

The Treasurer presented his Financial Report and the Accounts of the Society, duly audited, for the year 1926–27. On a motion by Dr. G. P. Bidder, seconded by Dr. W. J. W. Anderson, the Report and Statement of Accounts were adopted.

The Bye-Laws regulating the Election of Council and Officers having been read by the Assistant Secretary, the PRESIDENT declared the Ballot for Council and Officers to be open, and voting began.

The Assistant-Secretary and Librarian presented his Report as follows:—

During the Session fourteen General Meetings—including the Anniversary Meeting—were held. The total number of communications and exhibits presented at the thirteen Ordinary Meetings was 55, of which 42 or almost 76·4 per cent. were primarily of botanical interest and 13 or almost 23·6 per cent. were primarily of zoological interest.

The attendance of Fellows, Associates, and Visitors at the thirteen meetings—as far as can be calculated from the signature sheets—varied from 61 to 94, the average being 62 for Fellows and Associates, and 14 for Visitors.

From the 25th May, 1926, to the 24th May, 1927, the list of the Society has lost a total number of 36 names, being 20 Fellows, 4 Foreign Members, and 1 Associate by death, 4 Fellows by withdrawal, and 7 Fellows by removal. The detailed statement is as follows:—

DEAD.

Fellows.—Arthur Arnold Barrett; Humphrey Godwin Billinghurst; Thomas William Cowan; Corrado Donato Da Fano; John Nugent Fitch; Nevin Harkness Foster; John Dow Fisher Gilchrist; Charles Hedley; Charles Hunter; George Lewis; Joseph Jackson Lister; Reginald W. Phillips; George T. Porritt; James Rodway; Harold John Hastings Russell; Thomas William Sanders; Mary Anne Stebbing; Thomas Roscoe Rede Stebbing; Charles Turner; James Udale.

Foreign Members.—Giovanni Battista Grassi; Ludwig Radlkofer; Charles Sprague Sargent; Georg Ossian Sars.

Associate.—Matilda Smith.

WITHDRAWN. **Fellows.**—Thomas Maldon Fitch; Michael Cressé Potter; Ethelbert Ambrook Southee; Walter Henry Young.

REMOVED in accordance with the Bye-Laws, Chap. II, Sect. 6.

Fellows.—Seevaratnam Arunachalam; Surendra Nath Bal; William Frederick Bumsted; Harry Bertram Harding; John Laurence Pitchford Hollingworth; Dina Nath Mahta; Reginald Ernest Massey.

During the same period 38 Fellows have been elected, of whom 29 have qualified up to the 24th May, 1927.

On the 24th May, 1927, the numbers on the List of the Society are as follows :—

	Men.	Women.	Total.
Honorary Member	1	—	1
Fellows	657	106	763
Foreign Members.....	47	—	47
Associates	23	1	24
Totals	728	107	835

LIBRARY :—During the year 1926–27 the usefulness of the Library has increased in several directions. The Library Fund, hitherto constituted by the Bentham and Tagart legacies, has been increased by the addition of the Morey and Stebbing legacies and part of the Walker legacy, and now stands at about £1270.

From part of the Walker legacy two racks, each holding about 80 periodicals, have been provided and placed in the main Library, so that Fellows and Associates can consult current numbers of periodicals during Library hours on any day, whereas formerly, when they were displayed on tables in the Council Room, they were not available on meeting days, when they are most in demand.

By the courtesy of the Director of the Science Museum, the Society can now borrow on behalf of Fellows and Associates books and periodicals from the Science Library.

The galleries of the main Library have been furnished with electric lights, and books in these galleries can now be consulted during the dark days of winter with much less trouble than hitherto.

Since the 4th December, 1926, the Library has been kept open until 5 P.M. on Saturday afternoons.

A beginning has been made to keep records approximately indicating the extent to which the Society uses the Library. Since the 1st January, 1927, the number of visits recorded up to the 24th May, 1927, is 417.

The number of individual visitors during the same period is 198. On the 23 Saturday afternoons from the 4th December, 1926, to the 21st May, 1927, the number of visits is 47 and the number of individual visitors 35.

Since November 1926 the number of individual Fellows or Associates borrowing books is 133.

The total number of volumes borrowed from the Library from the 1st May, 1926, to the 30th April, 1927, is 1375, or an average of less than two volumes per Fellow or Associate per annum.

The total number of periodicals received by the Society is now 650, representing 52 countries and 18 different languages.

The number of volumes bound during the year is 508, at a cost of £162 5*s*. 3*d*. or an average of 6*s*. 4*d*. per volume.

Apart from the special collection of books, amounting to over a hundred, mostly on Entomological subjects, received under the will of the late George Lewis, 51 volumes have been added to the Library. Of these, 33 were presented.

In addition to books, a large number of reprints and pamphlets have been added.

In connection with the general work of the office and with the work of the Library, the assistance rendered by Mr. Spencer Savage and Mr. W. S. Warton merits commendation.

The PRESIDENT then, having appointed Lt.-Col. J. H. Tull Walsh, Mr. H. N. Ridley, and Mr. Edward Step as Scrutineers of the Ballot, delivered his Valedictory Address (see pp. 55–66). Thereafter Dr. B. D. Jackson, R.N.O., moved "That the President be thanked for his excellent Address, and that he be requested to allow it to be printed and circulated amongst the Fellows." The motion was seconded by Mr. A. W. Sheppard, and being put to the Meeting was carried by acclamation.

The Ballot having been closed, the Scrutineers retired with the lists, and after examination reported to the President, who declared the result as follows :—

COUNCIL FOR 1927–28.—Dr. G. P. Bidder; Dr. E. J. Butler, C.I.E., F.R.S.; Dr. W. T. Calman, F.R.S.; Dr. E. J. Collins; Mr. R. Cory; Mr. A. D. Cotton; Mr. H. N. Dixon; Professor J. Stanley Gardiner, F.R.S.; Dr. R. W. T. Gunther; Miss A. C. Halket; Sir Sidney F. Harmer, K.B.E., F.R.S.; Miss G. Lister; Professor E. W. MacBride, F.R.S.; Dr. Doris L. Mackinnon; Mr. H. W. Monckton, V.-P.G.S.; Professor J. Percival, Sc.D.; Mr. John Ramsbottom, O.B.E.; Dr. A. B. Rendle, F.R.S.; Dr. E. S. Russell; Dr. E. J. Salisbury.

(The retiring Councillors were Mr. E. A. Bunyard, Professor E. S. Goodrich, F.R.S., Dr. B. D. Jackson, R.N.O., Mr. R. I. Pocock, F.R.S., Mr. R. J. Tabor, B.Sc.)

OFFICERS FOR 1927–28.—*President*: Sir Sidney Frederic Harmer, K.B.E, F.R.S.; *Treasurer*: Mr. H. W. Monckton, V.-P.G.S.; *Zoological Secretary*: Dr. W. T. Calman, F.R.S.; *Botanical Secretary*: Mr. John Ramsbottom, O.B.E.

The PRESIDENT then called upon Professor H. GRAHAM CANNON, who had been selected for the Crisp Award and Medal, and addressed him as follows :—

Professor H. GRAHAM CANNON,—

By the terms of the late Sir Frank Crisp's donation this medal and the accompanying award are given "as a reward for the best paper dealing with microscopical research by a Fellow published by the Society since the previous award."

The Council, having carefully considered all the papers published by the Society since 1917 which deal with researches

that may be strictly termed "microscopical," have come to the conclusion that your paper "On the Post-embryonic Development of the Fairy Shrimp" is the most meritorious. It deals with a subject which could be investigated only by employing some of the most modern refinements of microscopical technique, and you have obtained results of great interest and importance. In particular, your demonstration of true cœlomic cavities and their subsequent fate in this Crustacean has confirmed and extended your earlier work on *Estheria*; and your conclusion that certain of the muscles are of ectodermic origin is one that bears on some of the most fundamental conceptions of embryology.

I have pleasure in handing you the Crisp Medal and Award.

Professor CANNON having suitably acknowledged the presentation, the President then called upon Dr. OTTO STAPF, who had been selected as the recipient of the Linnean Gold Medal, and addressed him in the following words:—

DR. OTTO STAPF,—

The Council on behalf of the Society have this year selected you for the award of the Linnean Medal as an expression of the Society's estimate of your services to science.

Your work has covered a wide field of botany over a period of nearly 50 years. When you came to this country to take up an appointment at Kew in 1891 you had already a reputation for careful botanical work. After studying under Prof. Wiesner in Vienna you had served for seven years as the assistant of Prof. Kerner von Marilaun at the Botanical Gardens and Institute of the University, you had travelled in Persia, and under the auspices of the Vienna Academy of Science you had published the botanical results of the Polak Expedition to Persia and of Dr. Luschau's collections in Asia Minor and Mesopotamia, and, later, an elaborate monograph of the genus *Ephedra*, which you had had good opportunity of studying in the field.

During 31 years' service in the Kew Herbarium, successively as Assistant for India, Principal Assistant and Keeper of the Kew Herbarium and Library, you proved a worthy successor to the eminent systematists Oliver, Baker, and Hemsley. Your numerous contributions to science during that period were marked by the same thoroughness which characterized your earlier papers. You contributed largely to the two great floristic works, the 'Flora Capensis' and the 'Flora of Tropical Africa'; your elaboration of the Grasses calls for special mention, as it has been accompanied by critical revision of the limitations of many of the genera; and your knowledge of the family has found expression in other publications, such as your erudite account of the oil-grasses of India and Ceylon, your investigation of the history of the wheats and of the remarkable *Spartina* phenomenon on our south coasts. We may claim to greet you as the greatest living authority on the family.

Of your contributions to Phytogeography we recall especially

your account of the flora of Mt. Kinabulu, in North Borneo, which occupies nearly 200 pages of vol. iv. of our 'Transactions'; and may also refer to your article on the Southern element in the British flora in the Engler 'Festband' in 1914.

Your exhaustive monograph on the Aconites of India was important from an economic as well as a botanical point of view.

Your contributions to botanical science also include morphological studies, such as that on the female flower and fruit of the remarkable Pandanaceous genus *Sararanga* and the fruit of *Melocanna*, a peculiar viviparous genus of Bamboos. Your skill as a draughtsman, which we have often had occasion to admire, has been a great asset in your botanical work.

Since your retirement from official duties you have been editor of two works of first importance to botanists and horticulturists —the 'Botanical Magazine' and the 'Revision' and 'Continuation' of Pritzel's 'Index Iconum,' to the publication of which we are eagerly looking forward.

Finally, we would gratefully recall your services to our Society during eight years as Botanical Secretary.

In 1898 you received the honour of election to our Associateship, which you resigned on becoming a Fellow in 1902. We now ask you to accept the highest honour that we have to award, our Linnean Medal, which I have much pleasure in handing to you.

Dr. Stapf expressed his profound appreciation of the honour that had been conferred upon him, and the President then declared the Session to be closed.

PRESIDENTIAL ADDRESS,

24th May, 1927.

You have already heard the reports of our Treasurer and Assistant-Secretary and Librarian, which indicate steady progress during the past year.

If we add the four names of those you have elected this afternoon, our roll of ordinary Fellows who have qualified now stands at 763. We are therefore approaching the limit, namely 800, which we set ourselves in December 1921.

Fellows will remember that this was an alteration in a Bye-Law (Chap. I. Section 1) passed by the Fellows on March 6th, 1919—The number of Fellows shall be limited to 710, exclusive of Honorary Members, Foreign Members, and Associates. At the ensuing Annual Meeting our President, Sir David Prain, took for his subject "The Relationship of the existing Statutes of the Society to the Present Needs." I have recently re-read this valuable address, which dealt at some length, among other matters, with the procedure to be adopted in the election of Fellows when the limiting number was reached and the establishment of a waiting-list had been rendered necessary. At that meeting the number of Fellows was stated to be 698, leaving 12 as the number of vacancies standing. Sir David laid stress upon the increased value of the Fellowship which would accrue from the establishment of a waiting-list and the principles of election which must guide the Council and Fellows under the new circumstances. At the next Anniversary Meeting, May 1920, the number of Fellows was reported to be 700, with 10 for Ballot at the ensuing General Meeting. We must presume, therefore, that between this date and December 1921 the number of Fellows elected did not exceed the number removed by death or other causes.

For some reason, or probably for no reason, the number of Fellows on the roll has not been reported at each Annual Meeting. The numbers of losses by death, withdrawal, or removal are stated and the numbers of Fellows elected; though here, again, until these have been qualified by payment of admission fee, they are not included in the roll. [I may mention that the Assistant-Secretary has started a simple register which shows the exact number of Fellows on any date, and also the proportion of compounders.] We may assume, therefore, that towards the end of 1921 we had attained the limiting number we had set for ourselves. Unfortunately, the factor of finance intervened, and we realized that 710 Fellows, a considerable proportion of whom were compounders who make no annual contribution to the Society, was inadequate to enable the Society to pay expenses. It was therefore necessary either to cut down expenses, or increase the subscription or the permissible number of Fellows. The last seemed the most reasonable expedient, and the permissible number was raised in December 1921 to 800. Up to the present 763

Fellows have qualified, and if we add the number who have been elected and will presumably qualify, including the four we have elected to-day, the number of Fellows is 770. Thus in six years our numbers have increased by 60, and we may reasonably look forward to reaching within a few years the number we have set before ourselves as a limit, when we shall again have to turn for instruction to Sir David's address of 1919.

The increase in our Fellowship from our Treasurer's point of view is, however, larger than the number indicated, as we are gradually replacing compounders by regularly subscribing Fellows —you will remember that we have for the time being suspended composition. During the past year we have lost six compounders. And, further, owing to the arrangement which you sanctioned of allowing the Council to remit the entrance fee in the case of Fellows joining below a certain age, the average age of Fellows is tending to be lowered, and we may look forward, therefore, to a longer life in the Society on the part of our Fellows. We have still to devise some means for retaining in the Society some of our older Fellows who at the end of their professional life find themselves on the retired list, with reduced means, and unable to support the burden of subscriptions to one or more Societies. In the address to which I have referred, Sir David Prain proposed the inauguration of an "Admission Fee Reduction Fund," to be named after our first Treasurer the Goodenough Fund. This could also be used by the Council for the payment of annual contributions in special cases. This Fund has not met with any marked success, and still stands at the amount £142—which it had reached in 1921.

Our Assistant-Secretary and Librarian, who since Dr. Jackson's retirement at the end of the previous session has assumed control of our domestic staff, has put in a year of hard work. At his own suggestion, and by means of some little re-arrangement of times of attendance on the part of his willing Staff, the facilities for consulting the Library have been extended; it is now open on Saturday afternoons and on every day throughout the year except Sundays, Good Friday and the following Saturday, Christmas Day, and Bank Holidays. The longer breaks at Easter and Whitsun have been dropped, and August is no longer a close month. Also at his own request the Council have arranged for Col. Gage to occupy the flat at the top of the building, which some of our older Fellows will remember was occupied by our last Assistant-Secretary, Mr. J. E. Harting. This will certainly imply no less devotion to the interests of the Society than he has shown during the past session.

In connection with the Library, Fellows will have noted that by the courtesy of the Director of the Science Museum our Society can now borrow books on behalf of Fellows from the Science Library, South Kensington. Also after careful consideration your Council have acceded to the request of the Central Library

for Students for the Society's Library to become an "Outlier Library," in return for a substantial grant from the Carnegie United Kingdom Trust.

Dr. Jackson has been with us through the year in his new capacity of Curator of the Linnean Collections, and has devoted some time to the compilation of a History of the Society, which will, we hope, in due course become available to our Fellows.

We have to record the death of three Foreign Members since our last anniversary. Prof. Ludwig Radlkofer, whom we elected in 1897, the doyen of German botany, died at Munich, where he had spent his whole life, including many years of active botanical work, at the age of 97. I met him at a festive gathering at Potsdam in 1910, when he was a still vigorous man of 80. He retained his activity almost to the last, and looked forward eagerly to completing his century. He gave up teaching duties many years before his death, but still retained his professorial chair and acted as Director of the Botanical Museum of the University. He was specially interested in the Sapindaceæ, which he elaborated for Martius's 'Flora Brasiliensis' and Engler's 'Naturliche Pflanzenfamilien'; as recently as 1925 he published a paper on a new genus of this family. His best-known work was on the application of anatomical characters to taxonomy, on which he published extensively. Much of Radlkofer's work and that of his pupils and other workers in his laboratory is contained in the standard book on the subject, 'Systematische Anatomie der Dicotyledonen,' by his pupil, Hans Solereder, which has been translated into English by two of our Fellows, Mr. L. A. Boodle and Prof. Fritsch.

Prof. Charles Sprague Sargent (elected in 1902) died in March last, nearly 86 years of age. He leaves, as a record of a life-work in the interest of American Forestry, classic publications on trees and shrubs, and the great Arnold Arboretum, near Boston, of which he became Director in 1872 and to the development of which he devoted the greater part of his life. I was privileged to meet him again in September last, when, though physically feeble, his mind was still alert in the interests of the Arboretum.

By a strange oversight the Society did not become officially cognisant until the present session of the death on May 4, 1925, of Prof. Giovanni Battista Grassi, Professor of Comparative Anatomy in the University of Rome, and Italy's most famous zoologist. His earlier work on the life-histories of intestinal worms and protozoa is familiar to specialists; his observations on "The Constitution and Development of the Society of Termites" has been described as one of the finest entomological works ever written. His study of the life-history of the eels solved a problem which had puzzled biologists for centuries; and his work on Malaria (1900) demonstrated the method of transmission of human malaria and the part played by the mosquito. He received the Darwin Medal of our own Royal Society in 1896, and was elected to our Foreign Membership in 1921.

The death of Prof. Georg Ossian Sars (elected 1899) on the 9th April last, a few days before he would have completed his 90th year, removes from the list of our Foreign Members the name of the foremost marine zoologist of our time. The son of the no less famous zoologist Michael Sars, Ossian Sars was a zoologist from his childhood. His first paper was published so long ago as 1861, and many of his discoveries have for so long been common property that their discoverer is sometimes forgotten. One need only recall here that it was he who, in 1864, showed that the eggs of the Cod floated at the surface of the sea, at the mercy of winds and currents—a discovery which may be said to be the foundation of all subsequent research on sea fisheries. But there is no group of marine animals, from Protozoa up to Whales, which Sars did not deal with in the long series of masterly researches which occupied him up to the last days of his life. The Linnean Medal was awarded to him in 1910, and no one ever better deserved the highest honour which it is in the power of our Society to give.

Twenty ordinary Fellows and one Associate have been removed by death from our roll of membership during the past session. The most notable loss was that of the Rev. T. R. R. Stebbing (1835-1926), who, though he did not join the Society until after middle life, in 1895 (he was then 60 years of age), soon entered into active participation in its affairs, serving on the Council from 1900 to 1907 and during the last three years as Zoological Secretary, succeeding the late Prof. T. G. B. Howes. His special group, the Crustacea, on which he became one of the foremost authorities, rarely provided subjects for discussion at our meetings, but he was a cultured man, who to a liberal education of the highest standard had added a wide course of reading; he spoke well and easily, and illuminated and often enlivened discussion not only during his short term of office, but for some years afterwards, during which he and his wife were very regular attendants at our meetings until weight of years made impracticable the journey up from Tunbridge Wells. Before his marriage, in 1867, Stebbing's interests were literary and theological. He had been successively Scholar, Fellow, Tutor and Divinity Lecturer at Worcester College, Oxford, and after ordination had held several teaching posts. After marriage he and his wife settled in Torquay, where he took pupils. As became an orthodox Evangelical Churchman, he proposed to confute Darwinism, but read the 'Origin of Species' and was converted. He became increasingly interested in natural science. In an autobiography which he wrote for the Torquay Natural History Society in 1923 he refers to his introduction, through his friend Canon Norman, to work on the 'Challenger' reports, which, he says, "before long put an end to tutorial business." His 'Report on the Amphipoda' (1888) is an example of his painstaking industry and thoroughness. It represents six years' continuous labour, and occupies 1774 pages of text and 212 lithographic plates, the drawings for which were

made by himself. The critical bibliographical introduction to the Report illustrates the meticulous care with which he worked up the literature of his subject. His wife and devoted companion, who survived him only by six months, was one of our original lady Fellows, having been elected on Dec. 15 in 1904.

Mrs. Stebbing supplied an interesting link with the past history of the Society; she was the youngest daughter of William Wilson Saunders, our Treasurer from 1861–1873. Wilson Saunders, as he was known, was keenly interested in horticulture, mycology, and entomology, and had a wonderful garden at Reigate in which he cultivated a great variety of plants, especially succulents and bulbous species. Many of these formed the subject of his 'Refugium Botanicum,' of which five volumes were issued (1868–1873). It was a publication somewhat after the style of the 'Botanical Magazine,' the plates for which were drawn by W. H. Fitch and the descriptions written by J. G. Baker, of Kew, excepting one volume devoted to Orchids, which were described by H. G. Reichenbach. Three of his sons became Fellows of our Society, one, Edward, attaining considerable eminence as an entomologist.

Stebbing, who lived at Reigate for a few years, describes the Saunders's home as a "very nest of naturalists." It is not surprising, therefore, that the daughter, whom Stebbing married in 1867, had an interest in botany. She was also an artist, and had made a collection of drawings of British plants, which were unfortunately destroyed by a fire. She would frequently send to the British Museum abnormal specimens from her garden with careful watercolour drawings; she thought they might be useful for the collections. She much enjoyed our meetings and the pleasure of meeting her friends at the Society. Her bequest of £100 to our funds was a graceful act of gratitude.

William Fawcett (1851–1926) joined the Society shortly after his appointment as an Assistant in the Department of Botany of the British Museum in 1881. His appointment coincided with the removal of the Natural History collections from Bloomsbury to South Kensington, and the work of reorganizing the herbarium occupied most of his time until he left in 1886 to take up the Directorship of the Botanic Gardens and Plantations in Jamaica. He found time, however, to contribute to our 'Transactions' for 1886 an account of some of those remarkable parasitic flowering plants—the Balanophoreæ. On returning to England on his retirement in 1908 he resumed attendance at our meetings. He was conscientious and consistent to a fault, and it was characteristic of the man that he felt compelled to resign his Fellowship after the outbreak of war in 1914 for reasons which to him were absolutely cogent. Happily, he was able to resume his connection with the Society some years before his death. After his return from Jamaica he settled down to work at the Flora of the island, volume v. of which was issued only three weeks before his death, after a few hours' illness, last August. He is remembered in

Jamaica for 21 years of devoted service in the interests of the island and its people.

Prof. Reginald W. Phillips had been a Fellow for 36 years at the time of his death. His devotion to the work of building up a school of botany and to the organization of University education in North Wales precluded any active interest in the affairs of our Society. He found leisure, however, for the study of the morphology of the Red Seaweeds, and on his retirement from his Professorship in 1922, at the age of 68, returned, in spite of ill-health, with almost youthful ardour to research. But a painful illness, ending in death, put a term to his work.

Botanical illustration has lost two noted exponents by the deaths of John Nugent Fitch, who had entered his fiftieth year of Fellowship, having compounded in 1877, and Miss Matilda Smith, whom we elected to an Associateship in 1921 on her retirement from her post as Botanical Artist at Kew. Fitch carried on the tradition of his uncle, Walter Hood Fitch, also F.L.S., a fine botanical artist who had been trained by Sir William Hooker. From 1876 onwards the nephew drew or lithographed plates for our 'Journal' and 'Transactions,' and in 1878 began to work for the 'Botanical Magazine,' for which he lithographed nearly 2500 plates. Many of these were drawn by Miss Matilda Smith, a cousin of Sir Joseph Hooker, by whom she was trained as a successor to the elder Fitch for the 'Botanical Magazine,' her first drawings for which appeared in 1878. In 1881 she was appointed artist and lithographer to 'Hooker's Icones.' Miss Smith also made the drawings for many important floristic works; special reference may be made to T. F. Cheeseman's 'Illustrations of the New Zealand Flora' (1914), of which the author remarks in his preface: "Miss Smith's capabilities are widely known among botanists, but these plates will enhance her already well-earned reputation." Miss Smith was a careful and conscientious artist, and her illustrations added greatly to the works in which she collaborated. She much appreciated her election to an Associateship.

On the zoological side we have lost two eminent overseas Fellows. By the death of Dr. J. D. F. Gilchrist, of Cape Town, South Africa loses her foremost zoologist, who for 31 years, from the time of his appointment as Marine Biologist to the Cape Government in 1895, had worked assiduously at the marine fauna of the South African region. One result of his surveys was the discovery of the valuable fishing-grounds at Cape Agulhas.

Charles Hedley went to Australia as a lad of 18 and took up farming. An accident to his arm which prevented hard manual labour induced him to devote himself to Natural History, which till then had been merely a hobby, and he entered the Queensland Museum as Conchologist in 1889. He shortly afterwards joined the Staff of the Australian Museum in Sydney, retiring after 33 years' service, in 1925, to take up the appointment of Scientific Director of the Great Barrier Reef Investigations Committee. His unexpected death at the age of 64 has been a

great loss to Australian Natural History, but his work on the zoo-geography of the Pacific area, many parts of which he had visited, will form a lasting memorial of his industry and devotion to science.

Mr. J. J. Lister, the son of our late Fellow, Mr. Arthur Lister, was a naturalist essentially in the spirit of our Society. His environment in childhood encouraged a love of nature, and four years of travel, study, and collecting in the Indian and Pacific Oceans (1882–86) widened his horizon, and were an invaluable supplement to the scientific course at Cambridge, where he had taken his degree in Natural Science in 1879. In vol. xxv. of our 'Journal' (1890) Mr. Hemsley described the collections made in Christmas Island during this trip. On his return in 1886 he settled in Cambridge, where he spent the rest of his life quietly occupied in pursuing his work of observation and research. His work on the calcareous Foraminifera gained him the Fellowship of the Royal Society in 1900.

In Humphrey Godwin Billingshurst (1887–1927) and Charles Hunter we mourn the loss of two of our younger Fellows. The former took up zoology as the outcome of a love of field natural history, and subsequently specialised in entomology. He held several teaching posts in biology, including a lectureship at King's College, London, and was an enthusiastic and helpful teacher; but he was handicapped all along by ill-health, and his determination to do the day's work at any cost to himself led to his premature death in his 40th year.

Charles Hunter left the Armstrong College, Newcastle, where he was trained, in 1912 to take up an Assistant Lectureship at Bristol University. After service in the war he returned to Bristol as lecturer in charge of the work in plant-physiology. He was specially interested in the relation of soil-aeration to plant-growth, and had published several papers on the subject. His health broke down in 1924, and he died last September at the age of 38.

Dr. Corrado Donato Da Fano, Reader in Histology, King's College, London, joined the Society in March 1926. He was M.D. (1905) and Libero Docente in morbid anatomy (1912) at the University of Pavia. After work in Berlin, London, and Gröningen, he became Vice-Director of the Pathological Institute at the University of Milan. In 1918 he came to King's College. He specialized in the histology of the central nervous system, and had published the results of his researches in about sixty papers in various journals. His unexpected death in March last has cut short a career full of promise.

George Lewis, who joined the Society in 1883 and died last September at the age of 87, was the recognised authority on the Histeridæ, a family of beetles, and his fine collection of over 12,000 specimens was bequeathed to the British Museum. He had spent many years in China and Japan, and also visited Ceylon and Algiers, collecting everywhere assiduously. His collections of Coleoptera provided material for numerous memoirs

by himself and other entomologists; these collections were also acquired by the British Museum. He bequeathed to the Society all his books and printed papers on entomological subjects.

Another entomologist, George Taylor Porritt, was one of our senior Fellows, having joined the Society in 1872. He lived and died in Huddersfield, where he was born in 1848. His special study was the British Butterflies and Moths, on which he was a leading authority. He contributed largely to William Buckler's voluminous work on the 'Larvæ of the British Butterflies and Moths,' published by the Ray Society 1886–1901, and edited the last five volumes.

Nevin Harkness Foster was a prominent Irish naturalist. One of his interests was the weight of birds' eggs, which he collected, and he published a series of papers on the subject in the 'Irish Naturalist' between 1902 and 1917. He also studied the Isopods. His most important contribution to science was a report on the wood-lice of Ireland, which he published conjointly with Mr. Beresford in the 'Proceedings of the Royal Irish Academy' in 1911.

To James Rodway (elected 1886), who had lived for more than 50 years in British Guiana, where he went as a young man in the early 'seventies, is owed the foundation and arrangement of the Georgetown Museum of Natural History and Anthropology, of which he was for many years Curator. He took a keen interest in the tropical vegetation of Guiana, which he described vividly in various publications. He was also a zoologist and a student of the native Indians and their customs. His 'History of British Guiana,' in three volumes (1891–4), is a standard work of reference.

Charles Turner (elected in 1922) had been successively Lecturer in and Principal of the Manchester School of Pharmacy. He was a keen microscopist and specially interested in British Freshwater Algæ. He contributed a paper on *Staurastrum Dickiei* to our Society. He was also an active member of the Manchester Microscopical Society.

Thomas William Sanders (elected 1902) was an enthusiastic gardener, and edited 'Amateur Gardening' from 1887 onwards. He had travelled widely in Europe to study horticultural methods, and was invested by King Oscar of Sweden with a Knighthood. He was a champion of the cause of natural gardening, and the author of over forty books on many phases of horticulture.

Thomas William Cowan (1840–1926), elected a Fellow in 1889, was a founder and a President of the British Bee-Keepers' Association. He was much interested in bees and bee-keeping, and wrote and lectured on the subject. His 'British Bee-Keepers' Guide' has been through many editions since its publication in 1881. (He died on Whit Sunday, May 23, 1926, but his death was not intimated until January 1927.)

This brief survey of our losses during the past year indicates the great variety of interests followed by our Fellows. In many cases also we can gratefully record active participation in the

work of our Society, but, on the other hand, we cannot but regret that some of our Fellows have been unable to associate themselves more actively with our work. In this connection, I would again refer to the undue proportion of our Fellows who have never taken steps to be admitted, which involves signing the obligation book. Until this has been done the Fellowship is not consummated, and the semi-Fellow cannot vote at a meeting nor take part in the business of the Society.

We have again to thank our two Honorary Secretaries for the interesting programme that they have arranged during the past season. A special feature of the meetings has been the personal accounts by our Fellows of their journeys of exploration and investigation in various parts of the world. Mr. I. H. Burkill gave a description of the vegetation of the lava-surfaces of various ages in the Crater of Kilauea, Hawaii, and Prof. R. R. Gates introduced to us the tundra-vegetation of Russian Lapland. An Australian Fellow, Mr. E. Ashby, sent an account of the flora of the Grampian Mts., an isolated mountain-area in Victoria, and another overseas Fellow, at present in this country, Mr. Mukerji, described the vegetation of Kashmir. Mr. A. J. Wilmott portrayed the Alpine flora of the Spanish Sierra Nevadas, where he spent some weeks last summer, and we may expect further information on the flora of the same country, as he has just started, in company with another of our Fellows, Mr. C. C. Lacaita, for two months' botanizing, with the help of a motor-car, in the same country.

The visit to America for the Botanical Congress last August gave some of our Fellows opportunity of a first-hand insight into some aspects of the vegetation of that great continent; we recall Dr. Hill's interesting account of the wonderful forest-vegetation of western North America. A month ago Miss M. A. Pocock signalized her election as a Fellow by a very beautifully illustrated description of a journey from the Zambesi westwards across Angola, and at the same meeting Dr. Hugh Scott described his exploration of the highlands of Central Abyssinia. At our last meeting we again welcomed Captain Kingdon Ward, who, with the aid of a beautiful series of lantern-slides, described his investigations on the Sino-Himalayan Flora and his views as to its origin.

Under the same heading we should include work nearer home—namely, observations on the vegetation of Wistman's Wood, Dartmoor, by Mr. T. A. Sprague and other Fellows, and Prof. Fritsch's account of the heath-association at Hindhead.

The proportion of communications of this nature, in which the lantern has so greatly helped, has much increased in recent years, and has doubtless been one factor in increasing the attendance at our meetings. We appreciate the opportunity of learning by so graphic a method the results of work in the field by our fellow-members.

Two of our leaders in British floristic work, Dr. Druce, whom we beg to congratulate on his recent honour, and Mr. C. E.

Salmon, have again brought to our notice plants of interest in our native flora; and Mr. Wilmott and Mr. Francis Druce, as the result of investigation on the spot, have solved a long-standing problem—the identity of the Irish *Spiranthes*.

On the genetical side Miss E. R. Saunders has put forward a solution of a problem which has puzzled botanists since the time of Dodoens in the 16th century—namely, the origin of the double stock. In this connection we have during the past session felt the loss of Dr. Bateson. But members of the staff of the John Innes Horticultal Institution have helped in our discussions, and the election of a member on our Council will bring us into closer association.

Morphology has been represented by Miss A. E. Chester's paper on the vascular supply of the bracts in species of *Anemone* and the relationship between bracts and sepals in some genera of Ranunculaceæ. The author showed commendable restraint in refraining from phylogenetic conclusions on an inadequate basis. Prof. Graham Cannon has added another to his series of papers on the morphology of Crustacea. Dr. C. M. Yonge's description of the ciliary feeding mechanisms in a group of Pteropods and Dr. Davidson's description of intermediate individuals in a species of *Aphis* evoked discussion on the evolutionary aspect; and Mr. J. R. Norman's communication on ambicoloration and associated variations in flat-fishes renewed an old controversy on the production of pigment by light in flat-fishes. Speaking generally, however, our communications have been informative rather than contentious, but the closing quarter of an hour of a recent meeting disclosed a lively difference of opinion when Sir Arthur Keith, whom we were glad to welcome as a visitor, contested Mr. Pycraft's claim of Rhodesian man to generic distinction based on his restoration of the pelvis.

Taxonomy has not figured conspicuously in our programme. Professor Moss's account of South African Potamogetons was a general survey rather than a taxonomic study, and Prof. Percival's account of the Species and Races of Wheat, a subject to which he has devoted many years of study, though of great interest, was admittedly a review of already published work. Mr. Cecil Norman's revision of the Tropical African species of the genus *Pimpinella* and Mr. James Groves's enumeration of a collection of Charophyta from Madagascar add to our knowledge of the two groups in question, as also does Messrs. Sprague and Summerhayes's critical examination of the taxonomic status and geographical distribution of some genera of Santalaceæ.

In former years the Linnean Society has been regarded as our chief medium for the publication of systematic monographs. Botanists from Kew and the British Museum brought before the Society the results of their intensive study of larger or smaller groups. I may recall, for instance, Mr. J. G. Baker's classic work on the tribes and genera of Liliaceæ, Dr. Master's survey of the Coniferæ, Mr. Ridley's and Mr. R. A. Rolfe's

revision of various genera of Orchids, and critical work by Mr. Hemsley and others. In one year, 1896, we published (vol. xxxii.) no fewer than five revisions of genera of flowering plants—*Pentas* by Scott Elliot, *Vanilla* by R. A. Rolfe, *Sararanga* by O. Stapf, *Silene* by F. N. Williams, and *Stemona* by C. H. Wright. A survey of our Journal for the last forty years indicates a falling-off in recent years of what we may term major monographic studies: many of the workers are still with us, but they are occupied with other matters, such as administrative or other duties, or floristic work. We are realising more acutely the importance of taking stock of the vegetation of our overseas dominions, and providing working floras for the various areas. The subject was discussed at the Imperial Botanic Congress in 1924, and we gratefully note progress in relation to several areas. We congratulute Dr. Dalziel and Mr. Hutchinson on the appearance of part 1 of a Flora of West Africa, and a South African Fellow, Dr. E. P. Phillips, on his useful key to the genera of South African plants. A second part of Professor Craib's 'Flora of Siam' and a volume of the 'Flora of Jamaica,' to which I have already referred, have also appeared during the year.

To some extent floristic work partakes of the monographic—such as, for instance, the accounts of some of the larger families and genera in the great Kew Floras of Tropical and South Africa. But in the "handy" floras devised to meet the immediate needs of workers in smaller areas the monographic study of the genera would delay too long the appearance of a much-needed book, and at best each genus is only studied so far as its representation in the area in question is concerned. Hence much of the floristic work is of a temporary nature, though it may be the best possible under the conditions.

The highest type of systematic work is the intensive comparative study of a genus, group of genera, or family through the whole range of its distribution, and so far as possible in time as well as in space. It is only by such work that we shall lay sure foundations for the study of geographical distribution and phylogeny. Conclusions based on work which treats genera and species as so many counters may be interesting and afford matter for discussion, but they will need drastic revision as knowledge increases. I would express the hope that our younger botanists will not lose sight of the importance of monographic work, though it may be of less general interest for the moment and excite the immediate admiration of a comparatively small circle of botanists.

I admit that the presentation of some of the monographs to which I have referred was not inspiring, but it should be possible to put forward the general results of a piece of work of the highest order in a way to interest a meeting of our Fellows.

I have not yet referred to one item of our meetings—a most important one—the exhibits. These have been numerous and interesting, and have given rise to some helpful discussions. We

recall the remarkable Cheetah skin shown by Mr. Pocock, the Giant Teredo by our Zoological Secretary, and Mr. Tate Regan's beautiful models of Oceanic Angler Fishes. Time does not allow of reference to others.

Our exhibits are frequently somewhat of a problem to our Secretaries, who have to arrange the meetings. For instance, at a recent meeting when an exceptionally interesting programme had been compressed into the smallest possible time, four new exhibits materialised on the day of the meeting. Several of these would have afforded matter for discussion, but only a brief reference to each was possible. It is impossible to do justice to exhibits which appear too late to have a place assigned to them in the programme, but I have suggested to the Secretaries that Fellows might be asked to bring or send their exhibits accompanied with a carefully written descriptive label, which the Secretaries will place on the table with the exhibit by 4 o'clock in the afternoon of the meeting, so that Fellows may have the opportunity of examining them in the hour before the meeting. Any time available during the meeting may then be used to the best advantage.

I have had the privilege of serving on the Council of the Society, with two breaks of one year each, since 1904, and continuously since 1913; my experience of the arrangements for conducting our business is that they are excellent except in one respect—the term of service which is expected from your President. In the case of gentlemen of leisure, such as the eminent zoologist whom you have chosen as my successor, four years may not be too long; but with a busy man whose service to the Society must necessarily be subsidiary to other duties, I think that three years is long enough. I think, too, that it is wise to have a fixed term. The office of President is not a sinecure, and to prepare for four years in succession, as part of an anniversary address, the results of some piece of scientific research, or a critical review of some aspect of science, demands considerable leisure or the qualities of a superman. With a Fellowship approaching 800 there should be no difficulty in maintaining a succession of suitable Presidents for the shorter term suggested.

My appreciation of the honour you have done me in calling me to this high office is equalled only by the sense of my limitations in the performance of its duties. I am gratified if I have been able to be of service during a period of some transition and reorganisation.

My best thanks are due to my colleagues and to the official staff for their willing co-operation, and to you all for help and consideration. And I assure you that my interest in the Society's welfare will continue unchanged, although it may be less conspicuously manifested.

The Sino-Himalayan Flora. By Captain F. Kingdon Ward. (Communicated by Mr. J. Ramsbottom.)

[Read 12th May, 1927.]

It has long been known that the floras of the Himalaya and of the mountains of Western China are closely related, as, indeed, seems natural from their proximity to each other—in fact, the whole mountain system from Nepal in the west to Yunnan in the east appears at first sight to be one, and the same might be expected of the flora. Drude in his vegetation map shows the alpine Himalayan flora as an extension westwards of the East Asiatic flora; and others have followed him.

Moreover, the alpine flora of the Himalaya bears a general resemblance to that of the European Alpine system; both are rich in Primulas, Pedicularis, Gentians, Saxifrages, and other genera. Owing to this, and to the well-known fact that alpine floras, from whatever part of the world, have impressed on them certain common features such as woolliness, cushion habit, rosette habit, etc., there has grown up a belief that the whole Eurasian alpine flora is one.

If, on the other hand, one were to travel in the Sino-Himalayan mountains, one would be struck by the great physical and climatic barriers which actually stand in the way of migration, and by the abruptness with which one passes from one climate to another—so much so that one might begin to wonder why it is that the floras resemble one another as closely as they do, when they seem to be so completely isolated. Our astonishment is increased when we learn that the Himalayan and Yunnan mountains are of very different ages. Finally, the Himalayan ranges trend more or less east and west, whereas those of Yunnan trend north and south. The truth is, the scoring of the country by deep river gorges is, in reality, a recent event, and the present flora spread over this region long before the gorges were formed. The Phanerogams are not as new as was formerly supposed, and, despite the physical barriers which now no doubt keep the Himalayan alpine flora from mixing with the Chinese alpine flora, their resemblances are easily accounted for by supposing that the flora originally covered a more or less uniform plateau, which has since been cut up.

What, then, are the relationships of the Himalayan and Chinese alpine floras, both to each other and to surrounding floras?

My argument can be very briefly stated thus: that the alpine floras of the Himalaya and of the Burma–Yunnan ranges are closely related, but that they are related in a manner different both in kind and in degree from that hitherto recognised.

Now, if the Himalayan uplift stretched unbroken across south-eastern Asia, there would be less difficulty in unravelling the relationships of the floras. Such a mountain barrier would divide more or less sharply a dry region to the north from a moist region to the south drenched by the rain-bearing winds blowing up from

the Indian Ocean and precipitating themselves against the southern face of the hills. The region behind this barrier would certainly, as at present, be drier in the north-west, becoming progressively moister towards the south-east, as the Pacific seaboard is approached; but this would not greatly affect the alpine flora, which would be comparatively uniform. On the other hand, the Indo-Malayan flora to the south would be cut off from the Central Asian flora to the north, and less effectively from the East Asiatic flora further east.

Unfortunately, the Himalayan mountains do not extend across Asia as simply as that; indeed, it is still an open question whether the axis extends east of the Assam valley at all, and, if so, in which direction. What we do find, east of Assam, is a series of lofty mountain ridges, trending north and south, parallel to one another, belonging to a totally distinct system; and if the Himalayan axis ever did cut across this more ancient uplift, one would expect tremendous confusion to have resulted. Thus one can easily understand how difficult it would be to pick up the broken threads of the Himalaya in the crust turmoil east of the Brahmaputra gorge.

Geologists maintain that one branch of the Himalayan uplift bends sharply round the head of the Assam valley, and is continued first southwards, and thence again eastwards through the islands of the Malay Archipelago, as the so-called Malay Arc. Professor J. W. Gregory, however, holds the view that this is not the only Himalayan extension, and that another branch does follow a more easterly course into Yunnan, where there is evidence of Himalayan movement. Professor Gregory* points to two series of high peaks running athwart the meridional ranges of Chinese Tibet, one in about latitude 27° N., the other a little further north, and suggests that one of these lines might mark the course of the Himalayan extension; though he himself favours an alignment more to the south-east, but admits that in western Yunnan "there is no clear evidence for the survival .... of any mountain due directly to Himalayan folding"†. Thus any attempt to follow the Himalayan uplift beyond the hairpin bend of the Brahmaputra is beset with exceptional difficulties, and must ultimately depend on two lines of research—(1) Geological; (2) Topographical.

It is possible, however, that Biological evidence may be admissible at this point, and that the distribution of plants and animals may help us, if not to solve the problem of the Himalayan axis, at any rate to decide where to look for it.

It must, however, be understood that if we set out to look for a range of snow-capped peaks stretching south of east from the Brahmaputra bend, we are looking for something which not only

* "The Geology and Physical Geography of Chinese Tibet etc." (Phil. Trans. Roy. Soc. Lon., Series B, vol. 213.)

† "The Alps of Chinese Tibet and their Geographical Relations." (Geographical Journal, March 1923.)

does not exist, but may never have existed. Evidence of Himalayan movements in these ancient rocks does not necessarily imply a definite range of mountains. There were mountains there already, of early secondary age, whose axis lay roughly north-north-east and south-south-west, and the later Himalayan movements would not produce simple folding, but might produce twisting and shearing (*e.g.*, river bends).

On the other hand, topographical evidence, which rests upon the existence of a large number of snow peaks, apparently arranged on meridional lines, but perhaps actually following a very different alignment, does suggest the possible remnants of a definite axis; in which event these snow peaks are to be regarded as the stumps of the Himalayan range, now, owing to recent causes, exhibiting a secondary alignment. It is hardly credible that these peaks, some of which are over 20,000 feet high, are of early secondary age. But the problem cannot be solved by topographical evidence alone.

Anyone travelling eastwards from the Brahmaputra bend cannot fail to be struck by the meridional arrangement of the high peaks; but had one seen the country during the Glacial Epoch, this arrangement might not have been so obvious.

Before Eocene times the Himalaya did not exist, though the Burma–Yunnan mountains did. However, there is no need to go as far back as Eocene times. It was the Glacial Epoch which had such a profound effect upon the flora of the country, and what happened before that we need not enquire into now. I therefore pass on directly to the Glacial Epoch, and the influence it had on the present distribution of floras in south-eastern Asia.

In an area of uplift such as Sino-Himalaya, which lies right outside the European ice-cap, one effect of the cold must have been to separate sharply the Arctic northern flora from the Indian southern flora. On southern slopes the alpine and subalpine flora would have been gradually pushed southwards, on northern slopes northwards, towards the Central Asian depression. Much of the latter no doubt perished: some may have found its way into China, following the south-eastern trend of the ranges.

There is abundant evidence, in the eastern Himalaya at any rate, that a continuous ice-belt occupied the crest of the range, and that the glaciers crept far down the valleys on either side; and this is true not only of the main range, but of the ranges further north, so that there was a regular belt of desert across the country.

In 1924, while in Tibet, I lived in a village situated at an altitude of 11,000 to 12,000 feet in an alpine valley which had formerly been occupied by a glacier ten miles long. There is no vestige of ice there now, even at 15,000 to 16,000 feet; but terminal and lateral moraines, the V-shape of the valley, and other indications were conclusive proof of glaciation. It was the same story all through eastern and southern Tibet, and where glaciers do still exist—as they must in a region where the highest

peaks rise to over 25,000 feet—they were only the shrivelled remnants of their former selves.

Last year, at the headwaters of the Irrawaddy, I found exactly the same thing on both sides of the Irrawaddy–Brahmaputra divide. The permanent snow-line here is 16,000 to 17,000 feet, and I could trace the courses of ancient glaciers down to well below 11,000 feet. There are a few permanent snow-beds left, but no glaciers.

Finally, going much further east, one can see how the glaciers have retreated or disappeared completely on the north-south ranges throughout Chinese Tibet, as I observed many years ago.

At the time these glaciers were at their maximum development, the present deep V-shaped gorges had not been cut by the rivers. Yunnan was a plateau with a gradual slope to the south and west. The rivers flowed in wide, shallow, high-level troughs. The alpine flora to the south and west must have been quite isolated from that to the north and east by a band of ice occupying the summits of all the ranges.

Great changes have since taken place. As the ice retreated, the southern flora crept back up the valleys and over the passes, the northern flora crept south, the eastern flora moved west. But one may suppose that the more prolific sources of supply would always have the advantage in the struggle to repopulate the waste places.

I might here refer to the question of discontinuous distribution, which is usually explained as the final phase of a once continuous distribution. But that is not a necessary assumption, since it may more logically be regarded as the final result of what I might call successive distribution.

A species is cut off from the main body by arctic conditions, let us say, and moves gradually south; either it keeps moving, or it adapts itself to the new conditions and becomes something else, or it perishes outright. It continues to occupy successive areas, and is as continuously moved on. At last the motive force ceases. The species having taken up a satisfactory position, remains there, and maintains itself, though completely cut off from the main base. But obviously it never really spread over the whole intervening space, though it passed over it.

Meanwhile, perhaps as a result of rivers breaking back into the Tibetan plateau, the post-glacial rivers of south-east Asia received more water and probably a fresh tilt from the north, and came rushing down their valleys, cutting deep gorges in the old plateau.

It is clear that during the southern ice-push in Asia there was no general advance of the Arctic flora southwards: no Arctic species are found in the Himalaya. There are many Himalayan genera which are found neither in the Arctic nor in the European Alps: e.g., *Meconopsis*, *Nomocharis*, *Wardaster*, *Kingdonia*, *Beesia*, *Isopyrum*, *Incarvillea*, etc. These are typically Sino-Himalayan.

The movements of the floras appear to have been along east and west lines on the Himalayan ranges, and on north to south

lines on the Burma–Yunnan ranges, though there has been no general movement of the East Asiatic flora southwards along the mountains of the Malay Arc. On the other hand, it has been suggested that the Himalayan flora was derived from the east, and the distribution of *Rhododendron* has been quoted in support of this, the number of species decreasing as you travel westwards. But on that argument the Yunnan flora might have been derived from the south, as it seems likely there are more species in Malaya and the Dutch East Indies than there are in Yunnan.

But the fact that the species decrease in a given direction is no proof that they have travelled in that direction—it may be just the opposite. Seeking to expand, they may develop under the more satisfactory conditions found in new territory.

With regard to the eastern Himalaya, the flora of Sikkim was formerly thought to be peculiar to that valley; but our botanical collections made in Tibet in 1924 proved conclusively that both the Sikkim and Bhutan floras spread far to the north and east, while the western China flora is found much further west than was suspected. For example, the Sikkim alpine Rhododendrons, *R. pumilum* and *R. vaccinioides*, were found as far east as the Tsangpo gorge, and the Bhutan *R. Kendrickii* also. The Szechuan Primulas, *P. Maximowiczii* and *P. szechuanica*, were found in the Tsangpo valley, and the Yunnan *P. chungensis* also, while the Yunnan Rhododendrons, *R. repens* and *R. campylogynum*, were found on both sides of the Tsangpo. *Meconopsis pseudointegrifolia* was found much further west also. Instances might be multiplied, but it will be enough to say here that amongst the Orchidaceæ, and in genera such as *Magnolia*, *Meconopsis*, *Primula*, *Rhododendron*, *Gentiana*, etc., the east and west connection is clearly seen.

But if one crosses the Himalaya from the plains of India to the plateau of Tibet, one finds a very different flora: and if one travels eastwards, or north-eastwards, from Burma, one again, though more gradually, reaches a different flora. In either event one crosses a great barrier, the first between the Indo-Malayan and Central Asian floras, the second between the Indo-Malayan and East Asiatic floras. But the Himalayan barrier is still there, whereas its extension is not; it has been so breached that only fragments of it remain. Yet its course may still be traced, in spite of extensive mixing of the floras, by the results of long isolation. That is to say, this great mountain system of Sino-Himalaya not only forms a great geographical barrier stretching from W.N.W. to E.S.E., but the alpine flora itself is of two distinct types; and just as the present alignment of the peaks bears no more than a casual relation to the geological structure, so the real distribution of the flora bears no more than a casual relation to the present alignment of the peaks. The distribution of the flora is much older than the present topography, and, owing to the fact that the plant-formations are mostly closed, has not greatly altered its arrangement since the present shape was impressed on the country.

I have spent some years trying to trace the direction of this dividing-line on the spot, and am beginning to see now how it runs.

In Sikkim and Bhutan it is obviously the line of the Great Himalayan peaks. East of the Tsangpo gorge it moves gradually southwards, the general direction being roughly east-south-east. Thus:—

On the Dihang–Brahmaputra, lat. 29° 30′.
Irrawaddy, 28° 0′.
Salween, 28° 0′.
Mekong, 28° 0′.
Yangtze, 26° 0′.

That is to say, if you ascend the gorges of these rivers, in about the latitudes indicated, you will notice a distinct change in the vegetation; the change, however, becomes more abrupt and well marked in succession from east to west. The transition is marked by a decrease in the number of Indo-Malayan forms, particularly amongst such genera as *Ficus*, *Strobilanthes*, and other Acanthaceæ, *Chirita*, *Æschynanthus*, and other Gesneraceæ, Zingiberaceæ, etc., and the appearance of *Pinus* and other Coniferæ etc.

Corresponding changes also take place in the alpine flora, particularly in the larger genera, such as *Primula*, *Rhododendron*, *Lonicera*, etc.

Now, if we take the best available maps and plot the above line, we find that it passes through, or very close to, a series of high snow-peaks, many of which I have seen and climbed on. These peaks appear at first sight to be isolated elevated portions of the meridional ranges; and one rather wonders why those particular portions should have been singled out for such high promotion. But if we ignore the deep river gorges which separate them, they are really quite close to one another laterally; and, remembering that the whole region was once a high plateau, the arrangement becomes quite intelligible.

Starting from Namcha Barwa, the great 25,000-foot peak in Assam Himalaya (lat. 29° 30′ N., long. 95° 0′ E.), the following snow-peaks are met with:—

Kangri Karpo, 20,000 feet: 29° 30′ N., 96° 0′ E.
Peak, 19,700 feet: 29° 0′ N., 96° 30′ E.
Lohit–Irrawaddy divide: 28° 30′ N., 97° 30′ E. Three peaks of 19,000 feet.
Irrawaddy–Salween divide: 28° 0′ N., 98° 30′ E. Gompa La, 17,000 feet?
Salween–Mekong divide: 28° 0′ N., 99° 0′ E. Kakarpo, 20,000 feet?
Mekong–Yangtze divide: 28° 15′ N., 99° 15′ E. Paima Shan, 20,000 feet?
East of the Yangtzej–Likiang range: 27° 0′ N., 100° 0′ E. 18,000 feet?
Kangkaling range: 28° 15′ N., 100° 30′ E. 19,000 feet.

As one travels eastwards there is a tendency for the peaks to be less isolated and to mark the southern ends of longer snowy meridional ranges; but that is the natural result of the breaching of the ancient plateau rivers flowing south, and the gradual encroachment from the south of warm winds. True, the northern ends of the ranges suffer from lack of precipitation, and might on that account be expected to have suffered more in general retreat of the ice than the wetter ranges further south. But this is more than balanced by the fact that they are, generally speaking, higher and also colder, being less wooded and under clearer skies. In fact, it is the bulk and height of these great snowy mountain ranges east of the Yangtze which has caused speculation to settle on them rather than on the southern ranges. For the Himalayan extension the Likiang and Tali ranges must be regarded as outliers of the system.

Accepting the above line then, which is topographically logical, we find a certain amount of biological evidence in its support. The flora to the north and east differs considerably from that to the south and west: more than that, the alpine floras on the two sides are different. Of course, some mixing has taken place since the retreat of the ice, many species having been able to cross the passes; but the essential distinction has been well maintained.

The distribution of such genera as *Rhododendron*, *Primula*, *Magnolia*, *Nomocharis*, *Coluria*, *Amphicome*, *Solms-Laubachia*, etc., may be cited in support. Most species of the above genera have a wide east-to-west extension on one or other side of the line, but not on both; their north-to-south extension is very limited.

As to whether the flora travelled from east to west, or in the reverse direction, there is not sufficient evidence to determine. Probably it has travelled both ways. Presumably there was a flora in western China before the Himalaya rose from the sea, and amongst the first plants to people the new uplift were doubtless Eastern Asiatic plants. But coming to comparatively recent times, and considering the position of the ice-sheet in Europe and the general trend of the Himalayan ranges from W.N.W. to E.S.E., one cannot help thinking that there would have been a general movement of the flora at that time towards Burma and China rather than away from it.

There has also been a movement southwards down the meridional ranges towards the islands, whereby *Primula imperialis*, for example, reached Java, and *Rhododendron Lochæ* Australia, long before the glacial epoch. But it must be remembered that the formations are now, and have long been, closed, so that under present conditions great migrations are impossible. The most obvious visible movements at present are colonisation of high areas as the glaciers continue to retreat.

It is necessary to remember that this Himalayan-Chinese flora is not alpine in the European sense. The Alps of Europe are generally supposed to have derived some of their flora from the Arctic, but clearly the Himalaya did not, and the resemblance between the European alpine flora and the Himalayan alpine flora

is only a broad resemblance, despite the fact that the mountain ranges belong to one system. There are a large number of genera found in the Himalaya which are not represented at all in Europe, and the species are almost universally different. In large genera such as *Primula*, *Pedicularis*, etc., usually different sections are confined to one region or the other. Coming down to the temperate regions of the Himalaya, we find whole classes which have no representatives in the European Alps—*e.g.*, Bignoniaceæ, Acanthaceæ, Gesneraceæ.

The southern alpine and sub-alpine flora of the Himalaya and western China may be called Indo-Himalayan, and the sequence from below upwards is as follows :—

Sea-level to 3,000 feet.		Indo-Malayan jungle.
3,000–5,000 feet.		Sub-tropical jungle (in valleys).
5,000–7,000 ,,		Lower Temperate Rain Forest.
7,000–9,000 ,,	Indo-Himalayan Flora.	Upper Temperate Rain Forest. Conifer Forest.
9,000–10,000.,		Conifer-Rhododendron Forest with Bamboo and Meadow.
10,000–11,000 ,,		Rhododendron Scrub.
11,000–12,000 ,,		Sub-Alpine region, with dwarf Bamboo.
Above 12,000 ,,		Alpine region : Scree, Meadow.

Naturally the formation differs considerably at the same altitude, according to local conditions—whether a valley, an exposed ridge, a north slope, or a south slope ; but the above gives a fair general idea of the sequence of vegetation, allowing for local variation.

North of the great divide there is no low-level flora, the entire country being elevated. The sequence of formations is as follows, the whole constituting what may be called the Sino-Himalayan flora :—

8,000– 9,000 feet.	Sino-Himalayan Flora.	Bush and scrub, scattered trees.
9,000–10,000 ,,		Rhododendron Forest ; Pine Forest.
10,000–11,000 ,,		Mixed Forest.
11,000–13,000 ,,		Conifer Rhododendron Forest.
13,000–15,000 ,,		Alpine Meadow, Scrub. Rhododendron, Moorland.
Above 15,000 ,,		High Alpine Scree, Turf, Moor.

The following comparison of typical genera, section, or species is instructive :—

	Indo-Himalaya.	Sino-Himalaya.
8,000– 9,000 feet ...	Magnolias : *rostrata*, *mollicomata*, etc., Maddeni Rhododendrons.	*Lonicera* spp., *Acer* spp.
9,000–10,000 ,, ...	*Abies*, *Larix*, *Tsuga*, *Acer*, *Magnolia globosa*, *R. aureum*, etc.	*Pinus* sp., "Taliense" Rhododendrons, etc.
10,000–11,000 ,, ...	"Sanguineum" Rhododendrons, *Nomocharis pardanthina*.	*Lonicera Webbiana*, *R. ixeuticum*, etc.
11,000–12,000 ,, ...	"Saluenense," "Campylogynum," and creeping Rhododendrons, etc.	"*Sikkimensis*" *Primulas*, *Juniperus*, etc.
13,000 feet	"*Amethystina*" and "*Soldanelloides*" *Primulas* etc.	"*Nivalis*" *Primulas*, *Nomocharis nana*.
15,000 ,, ...	——	"*Lapponicum*" Rhododendrons, etc.

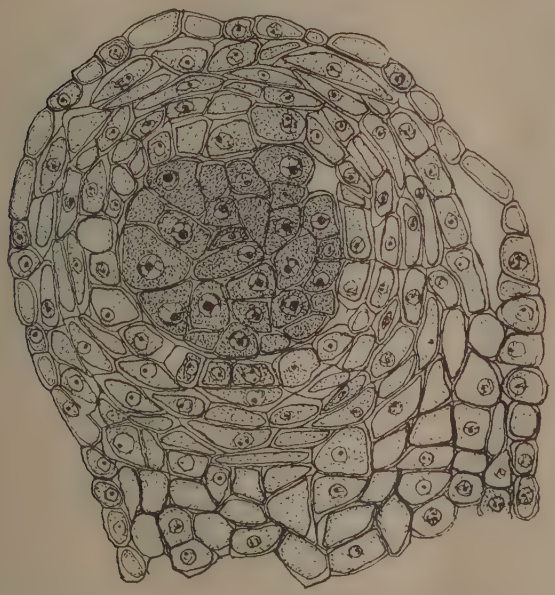
A Cytological Investigation of a Sport in a Plant of the Garden Stock.

By E. J. H. Corner, B.A.

At the meeting of the Society held on the 18th November, 1926, Miss E. R. Saunders exhibited and read a paper on a plant of the Garden Stock showing normal single and fully double condition of the flowers *. (See p. 5.)

A few very young buds from the apex of the main axis and of the two lateral axes with intermediate and fully double flowers,

Fig. 1.



Transverse section of a fully double flower-bud from which the sepals have been removed. × 65.

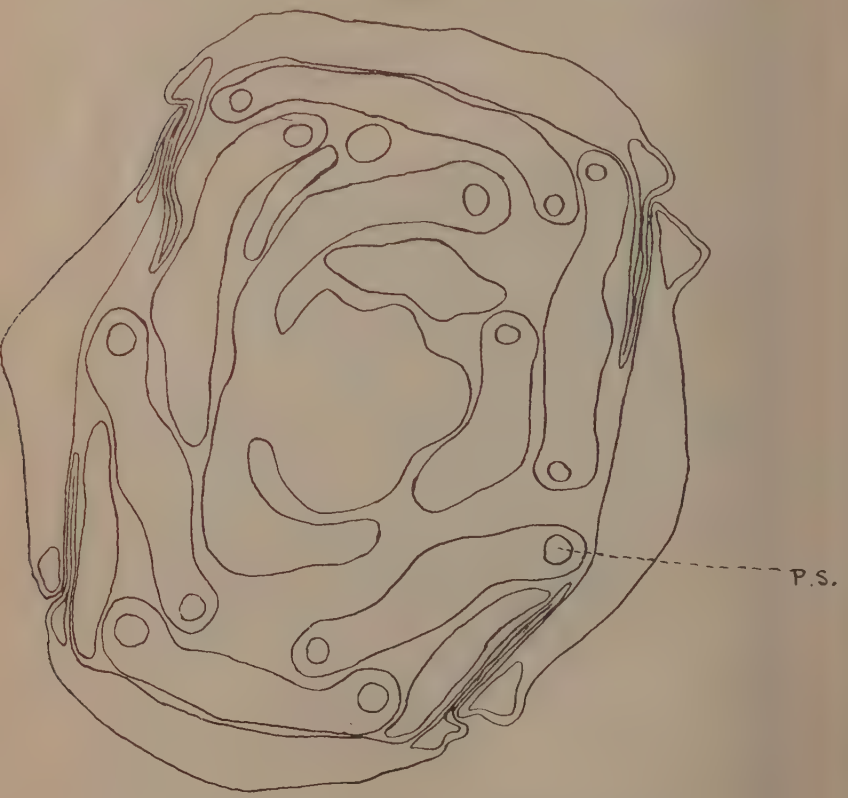
respectively, were fixed in acetic alcohol and given to me by Miss Saunders through Mr. F. T. Brooks for cytological examination. Sections were made and stained in iron alum hæmatoxylin.

The most noteworthy feature observed was the presence of distinct pollen-sacs in both intermediate (semi-double) and fully double flower-buds. (See fig. 1.)

* The specimen is now in the Museum of the Botany School at Cambridge.

The sacs occurred near the edges of the petaloid stamens, including in the intermediate type of flower the second set formed within the gynœcium. There were always only one or two sacs per petaloid stamen instead of the normal four pollen sacs of the stamens of the single flower. The archesporial tissue was clearly delimited as a separate tract of cells with denser cytoplasm and larger nuclei than those of the surrounding cells.

Fig. 2.



Transverse section of a pollen-sac from a fully double flower-bud. Archesporial cells delimited. × 530. *p.s.* = pollen-sacs.

In the intermediate (semi-double) flower buds the nuclear behaviour of the archesporial cells was exactly as described by Allen (New Phyt. 1924). All stages could be traced from the premeiotic phase to diakinesis in those buds in which the petaloid

stamens are not produced in any definite whorl, and in which the outer members are therefore a stage or two further developed than the inner. Nevertheless, the same petaloid stamen sometimes showed one pollen-sac with nuclei in synapsis and the other with nuclei in an earlier stage of division, or the stages were sometimes those of diakinesis and early prophase. In the single flowers all the stamens showed at any one time the nuclei of the pollen mother-cells in the same stage. In the oldest intermediate (semi-double) flower-bud there were two pollen-sacs showing resting nuclei in tetrads, and in one or two heterotypic and homotypic metaphases were evident, but such cases were, however, few. No stamen was old enough to show whether abortion of the pollen occurred or not. If abortion occurs—and Miss Saunders saw no ruptured sac in the opened flowers and no pollen—it must take place after the initiation of tetrads. A definite tapetum was present, the cells of which underwent disintegration at about the time of meiosis.

None of the fully double flower-buds showed stages older than the formation of the archesporium and tapetum. The nuclei of the former were evidently in premeiotic interkinesis, quite normal and with no sign of abortion. (See fig. 2.)

In all three kinds of flower-bud fourteen chromosomes were counted in somatic divisions, and seven bivalents were clearly seen in two or three instances of diakinesis in the intermediate (semi-double) flower-buds. There is, then, no difference in chromosome number between the double and the single flowers of this remarkable plant, nor was any other chromosomal difference apparent.

OBITUARY NOTICES.

Field-Marshal Sir Arthur Arnold Barrett was born on the 3rd June, 1857, the third son of the Rev. Dr. Alfred Barrett. He entered the army in 1875, and during his long and distinguished career saw much service, particularly on the North-West Frontier of India. He took part in the Afghan War of 1879–80, including the march to Kandahar; and between this and the last Afghan War in 1919, in which he was in command, he was in practically all the numerous North-West Frontier expeditions and during 1914–15 in the Mesopotamian campaign. His great services were recognized by the bestowal of a series of honours, commencing with the C.B. in 1903 and ending with the G.C.B. in 1918 and G.C.S.I. in 1920. Like many soldiers he was interested in the vegetation of the lands in which he served, and had not a few botanists in his circle of friends and acquaintances.

When he became a Fellow of our Society in 1901, his sponsors were Sir Dietrich Brandis, C. B. Clarke, W. B. Hemsley, and Theodore Cooke, three of whom had served for many years in India.

Sir Arthur retired from the Army in 1920 to live at Sharnbrook, in Bedfordshire. He died on the 20th October, 1926.

The late Field-Marshal was of the type of Fellow of greater value to the Society than is always recognized. It was to such as him that Dr. William Carruthers referred when in his Presidential Address to the Society on its Centenary Anniversary he remarked:—"From the foundation of the Linnean Society we have sought to include in our number the lovers and patrons of Science as well as its workers, and such Members have often rendered services to the Society that would be miserably represented were we to take into account only their money-payments to our funds. Our strength lies in progress on the same lines in the future." [A. T. G.]

Humphrey Godwin Billinghurst, was born at Streatham in 1887. He was an exceedingly delicate child and was reared with difficulty. His education had to be conducted at home, and this gave him early opportunity to follow his inborn tastes as a naturalist. He spent all the time he could out-of-doors observing plants and animals in their natural surroundings, and as he grew to manhood and his health became assured, he went on to study zoology at the South-Western Polytechnic in London, and then specialized in entomology at the Imperial College. Insects always interested him, and for a number of years he gave his spare time to investigating the insect-parasites of poultry at a farm in Sussex. He published several papers on these pests, giving useful instructions to poultry-keepers for dealing with them.

He early showed considerable gifts as a teacher, and at the time of his death he was lecturing and demonstrating to First Year Medical Students at St. Thomas's Hospital and at King's College in the Strand, where he had taught and worked with unfailing zeal for fourteen years. He also taught biology to the boys of Westminster School.

His happy sympathetic nature endeared him to his students. He had the gift for firing them with his own enthusiasm for natural science, and they were encouraged and helped by him at every turn. They were also inspired—as, indeed, were all his colleagues—by the gay and valiant spirit with which he consistently ignored ill-health and physical handicaps that would have daunted most men or turned them into peevish invalids.

It was his devotion to his work and his determination to live his life to the full, whatever the cost, that ended that life prematurely. He hid from everyone the pain he was enduring from an over-taxed heart, until at last it became impossible even for him to hold out any longer. After two months of distressing illness, he died at his father's house at Chislehurst on the 2nd February, 1927. [D. L. M.]

Thomas William Cowan devoted much time and attention to the study of bees, was a frequent lecturer on bees, and was well known as a judge of exhibits relating to the bee at shows. He wrote a good deal on the subject, his book on 'The Honey Bee' reaching a second edition in 1890. His 'British Bee-Keepers' Guide' passed through many editions from 1881 to 1924, and he was connected as editor or in other ways with 'The British Bee-Keepers' Journal' and the 'Bee-Keepers' Record.' He was one of the founders and at one time President of the British Bee-Keepers' Association.

Cowan was born in Russia in 1849, but was educated in England and trained as an engineer. For some time he resided at Horsham, in Surrey, but later on went to California and took up fruit-farming. He was a member of the Natural History Society of California. Returning to England he lived for some time at Taunton and in 1918 removed to Sutherland House, Clevedon, where he died on Whit-Sunday, May 23rd, 1926.

He was elected a Fellow of the Linnean Society in 1889, and also belonged to the Geological, the Royal Microscopical, and many other scientific societies. [H. W. M.]

By the untimely death of Dr. Corrado Donato Da Fano at the age of 48, histologists have lost a competent and distinguished colleague. He was born at Urbino in 1879 and educated at Milan and Pavia, where he graduated in medicine, becoming M.D. in 1905.

It was under the inspiring influence of Camille Golgi, in whose laboratory Da Fano served, that his interest in the microscopic anatomy of the nervous system developed, in which subject he

became a recognized authority. He was an accomplished microscopist and an untiring worker, publishing some sixty papers upon his subject and the technique of preparing and mounting cells for cytological analysis.

He also studied for a time in Ziehen's laboratory at Berlin, and later in London at the laboratories of the Imperial Cancer Research Fund, returning to Milan in 1912, where he became Libero docente. After the great War, during which he served as Captain in the Italian R.A.M.C., he finally settled in London in 1918, becoming lecturer, and later reader, in histology at King's College.

His charming personality endeared him to the hearts of all whose privilege it was to know him and work with him, and it was always his great pleasure to place his wide knowledge and technical skill at the service of others. By his mastery of the Continental literature upon his subject he rendered invaluable service to Science by his numerous abstracts published in the 'Journal of the Royal Microscopical Society,' of which Society he was admitted a Fellow in 1920, and also in 'Physiological Abstracts,' of which he was one of the editors. In 1926 he was admitted a Fellow of the Linnean Society of London. [C. T.]

William Fawcett was born on February 13th, 1851, at Arklow, Co. Wickford. He was educated at Dulwich College and King's College, London, taking his degree in 1879, after having served for some years as a master in a private school. He became an Assistant in the Department of Botany in the British Museum in 1880, at the time when the scientific collections were in course of removal from Bloomsbury to the new building in Cromwell Road, Mr. William Carruthers being then Keeper of Botany.

He was elected a Fellow of the Linnean Society in 1881, retired in 1914, and was again elected in 1923. At the end of 1886 he was appointed Director of the Botanical Gardens, Jamaica, in succession to Mr. (afterwards Sir) Daniel Morris. Fawcett remained in Jamaica for nearly 21 years, rarely visiting England. He was the originator of the International Exhibition held in Jamaica in 1891. For some years he was a Member of the Legislative Council, became Chairman of the Board of Governors of the Institute of Jamaica, Deputy Chairman of the Agricultural Society, and a Member of the Board of Agriculture; also he was a Corresponding Fellow of the Botanical Society of Edinburgh, of the Royal Horticultural Society, and of the Pharmaceutical Society of Great Britain. He retired from his official post in Jamaica in 1908, and settled at Blackheath, Kent, being thenceforward steadily engaged at the British Museum in work upon the 'Flora of Jamaica' until a few days before his death from heart failure on August 14th, 1926.

Fawcett founded the 'Bulletin of the Botanical Department, Jamaica' in 1887, and edited it until his retirement; after the publication of the first fifty numbers he reduced the awkward size of the periodical from folio to octavo. Here are to be found

his reports on the six public gardens in his charge. Using the 'Bulletin' as a convenient channel for distributing information and advice upon the cultivation of economic plants and the treatment of plant diseases, and by means of lectures, constant correspondence, and personal visits, Fawcett came into touch with planters in all parts of the island, and did all he could o promote the welfare of tropical agriculture and horticulture.

In 1893 he published 'A Provisional List of the Indigenous and Naturalised Flowering Plants of Jamaica," and in 1894 began, with the support of the Government of the island, a systematic investigation of the Flora of Jamaica, especially of the wilder eastern part, which produces a surprising abundance of new species as well as a few new records of plants already found in neighbouring islands and a few of the old vanished species. In this work he was greatly aided by the explorations made by William Harris and others. Being particularly interested in Orchidaceæ he procured with Harris's help an extensive collection of these plants, and employed Miss Helen Wood to make a valuable series of drawings from the living plants. When, after his retirement, he settled down to prepare and publish the 'Flora of Jamaica,' in collaboration with Dr. A. B. Rendle, the first volume to be issued was that on the Orchidaceæ, published in 1910 by the Trustees of the British Museum. Three other volumes, treating of Dicotyledons, followed in 1914, 1920, 1926, respectively. Two further volumes will be needed to complete this important work, which is based upon all the authentic material available.

Fawcett did much to foster the banana industry in Jamaica. During his years of office the value of bananas exported increased from £250,000 to £1,000,000 per annum. After his retirement he published in 1913, under the auspices of the West India Committee, an illustrated and carefully-prepared Monograph on 'The Banana: its Cultivation, Distribution, and Commercial Uses.' A new edition of this important work became requisite in 1921.

For these and other publications reference should be made to the Obituary Notice by Dr. Rendle in the 'Journal of Botany,' 1926, pp. 310–314, to which a more or less complete list is appended. Attention should also be drawn to a numbered series of "Historical Notes on Economic Plants in Jamaica," discussing the Pineapple, Banana, Mango, Tea, Tobacco, beginning in the Bulletin Bot. Dept. Jamaica of 1910, and continued in the Bulletin Dept. Agric. Jamaica of 1903, 1906, 1908.

A recent portrait of Fawcett was given in the Natural History Magazine of the British Museum, 1927, p. 30.

William Fawcett was a kindly, courteous gentleman, who endeared himself to all with whom he came in contact in the course of his long and honourable career. [A. Gepp.]

John Nugent Fitch, the well-known and veteran botanic artist, was born at Glasgow on the 24th October, 1840, and was trained

as a draughtsman and lithographer by his uncle, Walter Hood Fitch (1817–92), who was trained by Sir William Hooker to be his artistic exponent in his many illustrated works, both when Professor at Glasgow and when Director of the Royal Botanic Gardens at Kew. The younger man worked under his uncle's supervision, and it was not until 1877 that his name appeared on many plates, including a long series for 'The Botanical Magazine,' which he took over when his uncle relinquished his task. It was at this time that he produced a striking proof of his skill as a lithographer. The French artist Rivereux had drawn *Cinchona Calisaya* var. *macrocarpa* for the 'Quinology of the East Indian Plantations' by John Eliot Howard, who intended to have it engraved in copper in Paris under the eye of the artist; but Fitch begged to be permitted to show what he could do by lithography, and, leave being granted, he produced the fine plate which closes the volume. Although he was often charged with the task of drawing from the actual objects, most of his work was that of putting on stone the original work of others: so in 1878, when he started work on 'The Botanical Magazine,' his function was to reproduce the drawings at first made by Lady Thiselton-Dyer and afterwards by Miss Matilda Smith (our recently deceased Associate); altogether nearly 2500 plates were drawn on stone by him for that old-established serial. He also illustrated the eleven quarto volumes of Robert Warner's 'Orchid Album' from first to last, 1882–96. He was in the habit of so trimming his sable brushes that they would hold an unusual quantity of ink, so that he was accustomed to draw the outline of an octavo plate without having to recharge his brush.

Known chiefly as a botanic artist, he drew many plates of lepidoptera for various works.

He was elected a Fellow of the Society on the 6th December, 1877, and frequently might be seen in the library copying from or referring to plates in our possession. In consequence of an illness in 1920, he lost the use of his fingers, his artistic career then closing; a few years before his death, of acute bronchitis, on the 11th January, 1927, at the age of 86, he was awarded a Civil List Pension. He was buried at East Finchley. [B. D. J.]

Nevin Harkness Foster, a prominent Irish naturalist, was born in the County Tyrone on the 18th March, 1858. At an early age he became keenly interested in birds and their habits. He was an industrious collector of birds' eggs, and one of his first contributions to natural history was an account in 1902 of the weight of birds' eggs. In subsequent years, between 1902–1917, a series of papers on this subject was published by him in the 'Irish Naturalist.' Possessed of remarkable powers of observation, he soon extended his knowledge to other groups of animals, and in 1907 he wrote his first report on the terrestrial Isopods of the County Cork. From that time onward he became a frequent contributor to the 'Irish Naturalist' and the 'Proceedings of the

Belfast Naturalists' Field Club' on Woodlice and other invertebrates. The most ambitious paper he wrote, in conjunction with Mr. Jack Beresford, was a report on the Woodlice of Ireland, their distribution and classification. This will always be a valuable token of remembrance of his proficiency and perseverance in the acquisition of knowledge. It was published in 1911 in the 'Proceedings of the Royal Irish Academy,' of which Society he was a member. In the last few years of his life he devoted some attention to Myriopods, and made many striking discoveries of species in Ireland. It was in the brief intervals of a busy life that Foster acquired his extensive knowledge of natural history. In 1926 his health began to fail, and he died after a long illness on the 23rd January, 1927, at Hillsborough, County Down, where he had resided for many years. [R. F. Scharff.]

The death of Dr. J. D. F. Gilchrist, which occurred at the St. James Aquarium, near Cape Town, on October 4th, 1926, deprives South Africa of her foremost and best-known zoologist. From the time of his arrival in South Africa to take up the newly-created post of Marine Biologist, up to the time of his death, a period of 31 years, he was working assiduously to collect and make known the marine fauna of a region which, even nowadays, is imperfectly known. In South Africa and throughout the world he achieved a well-earned reputation.

Prior to the commencement of his life's work, Gilchrist does not seem to have done a great deal of research, but he has published several papers on Mollusca, obtaining the Ph.D. at Zurich with a thesis on the mantle organs of the Tectibranchs. He was interested in Nudibranchs, and in the course of his personal collecting seems to have paid rather more attention to this group than to others (*vide* Bergh's Report in Mar. Invest. v.).

Gilchrist was, however, by no means a narrow specialist. His association with Sir John Murray had developed his appreciation of the value of all branches of oceanographic research. Thus he was singularly fitted for the task of investigating the marine fauna and environmental conditions of the South African coasts.

Until the Cape Government instituted the Marine Survey, very little was known about the marine fauna of South Africa. The early travellers had made collections of the commoner and more striking fishes which were described by the classic writers Cuvier and Valenciennes, Smith, Pappe, Bleeker, Castelnau, and others. Collections of the littoral Crustacea, Mollusca, and Hydroids had been made. Exploring vessels—*e.g.*, the 'Novara' and the 'Challenger'—had done a little dredging in Cape and Natal waters. No systematic investigations by trawl and dredge, however, had been carried out.

This gap in our knowledge of the marine faunas of the world was filled by the magnificent collections brought together by the s.s. 'Pieter Faure,' operating from 1897–1906 under Gilchrist's direction.

The reports on this material may be said to have revolutionized ideas as to the composition and richness of the fauna of the South African region. The results are all the more remarkable, seeing that the operations were not carried out solely for scientific purposes; the latter were subordinate to the endeavour to discover new and workable fishing-grounds.

Gilchrist himself undertook most of the descriptions of the new fishes brought to light by the Survey. The erection of an aquarium, albeit a mere crude, unequipped toy in comparison with marine laboratories in other countries, gave him the opportunity of making observations on the eggs and larvæ of many of the commoner Cape fishes. Here also he worked on the local forms of *Phoronis* and *Balanoglossus*.

After the first Survey was retrenched, some considerable time elapsed before Gilchrist was able to prevail upon the Union Government to recommence operations. The new Survey was still directed mainly upon economic lines, but a large amount of purely scientific dredging and trawling brought to light further remarkable additions to the fish and invertebrate fauna.

Gilchrist was no great lover of systematics. The description of the fishes of the first survey is practically his only systematic work. It was well done. In later years he collaborated, firstly with W. Wardlaw Thompson and then with young graduates of the Zoological Department of the University of Cape Town. Though his name appears as senior author in various papers, the work was done by his collaborators, and pressure of other and more absorbing work prevented him from exercising as full a criticism as could have been desired. This explains the great difference in quality between Gilchrist's earlier work and the later work to which he put his name.

It must be confessed also that Gilchrist was not over-considerate towards later investigators. When the particular research on which he was engaged was completed, he was careless as to the ultimate fate of the material on which he had worked. This may have been due to lack of proper housing facilities for the collections, and also to a certain incompatibility of temperament with the then Director of the South African Museum, where the collections should most properly and conveniently have been deposited. Thus before the collection of the first Survey came into the possession of this Institution, many types and unique specimens had been lost.

As a teacher of zoology Gilchrist was not in his element. He was too wrapped up in the research side of the subject to worry much over the generality of students He was, however, a lucid lecturer. Though he kept himself up to date with reference to recent zoological research, on certain aspects—as, *e.g.*, geographical distribution—he was curiously conservative. At meetings of the Royal Society of South Africa the writer had more than one argument with him as to the possibility and adequacy of the "floating log," and was invariably given the *coup de grâce* by the axiomatic

statement "logs *do* float." Wegener's theory never appealed to him, though it is doubtful whether he was sufficiently interested in geology to appraise the evidence.

Gilchrist was an energetic worker in the interests of the South African Association for the Advancement of Science and the Philosophical Society. He was mainly instrumental in obtaining the Charter by which the latter body became the Royal Society of South Africa. He was co-editor of the handbook 'Science in South Africa,' which was published on the occasion of the British Association's visit to that country in 1905.

In the 'Journal of the Linnean Society' he published several papers, including his interesting discoveries of the early stages of Cape Crayfish (*Jasus lalandii*).

Quiet and unobtrusive almost to a fault, Gilchrist possessed a very firm and persistent resolution in obtaining what he wanted. His energy was wonderful and his courage in face of his affliction exemplary. He was endeavouring to continue his work up to a day or two before his death.

His death removes a familiar figure among South African scientists, and a researcher whom it will be difficult to replace. May the Marine Survey continue as the most appropriate memento of his life! [K. H. Barnard.]

Battista Grassi, who died on 4th May, 1925, at the age of 71, was the most eminent zoologist of his time in Italy. Born in Rovellasca, in the province of Como, he early showed a great interest in natural history, and after taking a medical degree in the University of Pavia devoted the rest of his life to the study of zoology. Although by no means of robust health, he pursued his researches to the end with untiring energy and enthusiasm. Few zoologists have made so many and so various brilliant discoveries, more especially in the domain of parasitology—for the history of parasites soon attracted him, and of his numerous contributions only a few of the more outstanding can here be mentioned. While still a medical student he made important observations on the development and transmission of the dangerous Nematode worm (*Ankylostoma*) and on other intestinal parasites. Later, Grassi studied with Kleinenberg in Messina, with Gegenbaur and Bütschli in Heidelberg, and with Semper in Würzburg. Among his valuable contributions to our knowledge of parasitic Protozoa may be mentioned his account of *Giardia*, of the transmission of *Entamœba coli* in Man, and of the ciliates found in Termites. It was in Sicily that he became interested in these insects, and attacked the fascinating problem of the origin of the various castes composing their complex societies. The publication of various papers and a fine monograph in collaboration with Sandias marked an epoch in the advancement of this branch of zoological science. His detailed study of the structure of the Thysanura, Myriapoda, and related forms, and of the embryology of insects yielded valuable discussions on the general morphology

and phylogeny of the Arthropoda. In 1883 this versatile naturalist brought out a new, now classical, monograph on the Chætognatha, a group of pelagic marine worms of doubtful affinity ('Fauna and Flora of the Gulf of Naples,' v.). More sensational was his work, begun in collaboration with Calandruccio, on the life-history of eels, a subject so far hidden in mystery. In a series of papers culminating in his monograph of 1913 it was shown that the eggs develop in deep waters, passing through a larval stage known as the Leptocephalus—a discovery since followed up and extended by others with remarkable results.

Grassi also wrote several memoirs on insects of economic importance, such as the *Phylloxera*, the Sand-fly (*Phlebotomus*), and the House-fly. But it is perhaps for his work on Malaria that his memory will be most gratefully treasured abroad, although, owing to certain unfortunate controversies concerning priority, full credit for his discoveries has rarely been accorded him in this country. From 1890 onwards, with the help of Bignani, Bastianelli, and others, he studied the nature and propagation of malaria, extending and confirming his observations by means of ingenious experiments. His results were made known in a series of important papers, and his great monograph, 'Studi di uno zoologo sulla malaria' (1900), contains the most detailed account of the malarial parasites of Man ever published. Like so many of his works, this monograph is remarkable for the originality and trustworthiness of the observations recorded, for the perfection of the technique employed, and for the beauty and accuracy of its illustrations. It was Grassi and his collaborators who first succeeded by actual observation and experiment in finally solving the problem of the transmission of the human malarial blood-parasite, in proving that *Anopheles* is alone responsible for its transmission, and in tracing the complete life-history of the parasite in the mosquito.

Such a brilliant record of scientific achievement might well be thought to have used up all his strength, yet Grassi devoted himself to official duties with zeal and success, and served on several commissions. Elected to a Chair of Zoology and Physiology in the University of Catania in 1883, he was later called to the University of Rome. In his native land he received many honours and was made a Senator of the Realm in 1908. The Royal Society awarded him the Darwin Medal in 1896, and in 1921 he was elected a Foreign Member of the Linnean Society. [E. S. G.]

Henry Brougham Guppy, who died at Martinique, in the West Indies, on April 23rd, 1926, at the age of 72, joined the Linnean Society as a Fellow in 1917. He was widely known for his researches on the distribution and dispersal mechanisms of the plants of the Pacific Islands and the West Indies, on which subjects he published three large volumes under the titles 'Plant Dispersal,' 'Studies in Seeds and Fruits,' and 'Plants, Seeds, and

Currents in the West Indies and the Azores.' For many years to come these works will be the principal sources of reference to the branches with which they deal. Of the three, perhaps the first-named is the freshest and most inspiring. Though a rich storehouse, it is no mere chronicle of observations, for Guppy was a philosophical botanist, always ready to see their possible bearing. Thus, in connection with his study of mangrove plants, he drew the conclusion that the viviparous habit, so characteristic of these plants, was not, as generally supposed, a special adaptation to habitat, but represented the survival of an ancient and much more widely dispersed feature. The seed with a resting phase was a derivative of older forms possessing continuous development—a condition surviving to-day in the mangroves alone.

The last paper which Guppy contributed to the Society's Journal (Bot. vol. xliv. 1919), under the title "Plant Distribution from the Standpoint of an Idealist," embodied some of the conclusions on evolution which he had reached. Dealing with the flowering plants, he asserts that "the age that witnessed the rise of the great families and the age that witnessed their subsequent differentiation are things apart, and cannot be dealt with by the same method." The rise of the families—a period of mutations—corresponded to a period of relatively uniform conditions, whilst the differentiations of these families synchronized with the differentiation of climatic conditions. At the present time this view cannot be said to be established for Flowering Plants—and, so far as other great groups are concerned, the evidence of fossil botany offers little corroboration.

The opportunity for these researches came to Guppy when he was a naval surgeon attached to a surveying ship in the Pacific, and this taste remained throughout life. Besides plants and distribution problems, he paid much attention to geology and ethnology.

An earlier paper, published by the Society in 1892, deals with "The River Thames as an Agent in Plant Dispersal," and is a model of what such a paper should be.

In 1917 the Society's Gold Medal was awarded to Guppy, and a year later he was elected into the Royal Society. [F. W. O.]

Charles Hedley.—The younger generation of Australian naturalists experienced even a greater loss than the world of Science in general, owing to the sudden death of Charles Hedley at Sydney on September 14th, 1926, as the young student in search of advice had no more courteous friend. However busy he was, even on most important work, he always found time to assist anyone in search of information, and his wide reading and extensive travels had afforded him a field of general knowledge far above the ordinary.

Whilst an expert conchologist, his extensive knowledge of zoology and natural history in general gave him a wide command

of subjects. His knowledge was happily linked up with a most courteous personality, and those of us who had the privilege of knowing Charles Hedley, and of travelling on sea and land with him, recognise to the full the loss that his death will mean to Science, and our sympathy goes out to Mrs. Hedley and her adopted daughter, who must feel their loss most keenly.

Born in England in 1862, Charles Hedley spent a portion of his school-days on the Continent, but was still a young man when he arrived in Australia. He settled in Queensland and engaged in farming, pursuing his natural history collecting, which he indulged in as a hobby. Later he turned his hobby into his profession, and entered the Queensland Museum (1889), and a few years later joined the staff of the Australian Museum, Sydney. Meanwhile, he had been on a collecting-trip to New Guinea.

In 1891 he was appointed Conchologist to the Australian Museum, in 1908 Assistant Curator, and in 1920 Principal Keeper of Collections. He resigned in 1925 in order to accept the position of Scientific Director of the Great Barrier Reef Investigation Committee, which position he held at the time of his death—in fact, he was in Sydney on his way to the Pan-Pacific Conference at Tokio when he was overtaken by a sudden illness which proved fatal.

Had he been spared to take part in the Japanese Conference, the world of Science would have been the richer. Whilst his extensive travels in Europe, Africa, and America gave him a wide knowledge, yet his investigations in the Pacific fitted him in a pre-eminent manner to take part in the Pan-Pacific Conference. His work at Funafuti, New Guinea, the Barrier Reef, and other coral-girt shores had enabled him to gather data and information beyond the reach of most investigators: and yet with all his knowledge he was ever ready to make it available.

He found time to write for many Societies, and his writings will serve as one memorial to his life's work. In addition, consideration is already being given by the scientific societies of the Commonwealth to a memorial of another kind, which will serve to recall the able work of Charles Hedley and to bring it under the notice of future generations.

In addition to being a Fellow of the Linnean Society, he was also a Fellow of the Malacological Society, an Honorary Member of the Royal Societies of New South Wales, Victoria, South Australia, Queensland, and West Australia, and a Corresponding Member of the Zoological Society and of the Academy of Natural Sciences of Philadelphia. In addition, he was Past President of the Royal, the Linnean, and the Royal Zoological Societies of New South Wales. [Clive Lord.]

Charles Hunter was born at Great Ayton, Cleveland, Yorkshire, on July 23rd, 1888, and received his education as a boy at the High School, Middlesbrough. He was a student at Armstrong

College, Newcastle-upon-Tyne, from 1908 to 1911, after which he acted there as student-demonstrator to Professor M. C. Potter till 1912, when he took up an Assistant Lectureship at Bristol.

Shortly after the outbreak of the War he joined the Bristol University Contingent of the Officers' Training Corps, to which he remained attached till gazetted 2nd Lieutenant in the Somerset R.H.A. (T.F.) on November 30th, 1915. He proceeded to France in June 1916, shortly after the sudden death of his first wife. Wounded at Morval, on the Somme, on November 10th, 1916, he returned to England, and after recovery early in 1917 he acted as Gunnery Instructor to No. 8 Reserve Brigade R.H.A. Demobilised on December 28th, 1918, he did not long remain outside the Army, for in July 1920 he was appointed Second-in-Command of the 367th (Bath) Battery of the 94th (Somerset) Brigade R.F.A. (T.A.) with the rank of Captain. This unit was later on disbanded, and Hunter gave up his military activity, having gained the rank of Major.

After demobilisation, Hunter returned to his work at Bristol as Lecturer, with special charge of the physiological work in the Department. His interests were mainly physiological, though he took great interest in the Liverworts, as witness a paper published in vol. xxxvi. of the 'Annals of Botany' by Miss Ridler, on the Fungus present in *Pellia epiphylla* (L.) Corda, which owed its inception to Hunter. He was chiefly interested in the distribution of air in the soil, and its effect on the rate of growth of plants. It was his hope that by mastering some of the difficult problems of the aeration of the soil he would be able to discover many points of physiological interest and ultimately of practical importance. The soil and its aeration was always the central point about which his thoughts revolved. Many smaller problems which students investigated at his suggestion were really concerned with this major problem.

Hunter was quiet and retiring by nature, but at the same time he could be stubborn, though nothing but lovable in his dealings with his colleagues and students. He will be missed by all.

Illness, brought on possibly by the War, began to undermine his strength in 1924, and he never really regained it fully. But he refused to give in. He continued to conduct his classes till the end of the last spring term, but did not return for the summer term. Friends who visited him found him cheerful and always full of hope and schemes for the future. He gradually sank and died peacefully on September 23rd, 1926. He left as a widow his second wife, whom he married shortly after the War. [O. V. D.]

George Lewis, F.L.S., F.E.S., who died at Folkestone on September 5th, 1926, was born on August 5th, 1839, and was the second son of the Rev. R. G. Lewis, first Vicar of St. John's, Blackheath, S.E. He was educated at the Blackheath Proprietary School.

In 1862 he went to China in a tea business, and returned home after ten years.

He married Miss Julia Hunter, of Inner Park Road, Wimbledon Common. Soon after his marriage, in 1867, he spent several years travelling and collecting beetles in Japan, and he visited that country again in 1880. He also collected in Ceylon and Algiers.

He had been for many years the recognized authority on the beetles of the family Histeridæ, of which he bequeathed to the British Museum a magnificent collection of over 12,000 specimens, including the types of no fewer than 700 species described by himself. An ardent entomologist from boyhood, he made important collections of beetles in the East, most of which were acquired by the British Museum some years ago.

Much of the collection formed during his first visit to Japan was destroyed, although many new species were described by the late H. M. Bates.

An itinerary of his Ceylon journey was published by him in Trans. Ent. Soc. Lond. 1882, and that of the Japanese expedition of 1880–81, with a map, was given by H. M. Bates in the same Transactions for 1883.

A very large proportion of Lewis's captures proved to be new to Science, and numerous important memoirs were published upon them by himself and many others whose services he enlisted for their study.

His collection of Japanese Coleoptera is undoubtedly the most important ever made in this country. All his specimens were mounted by himself, and for condition and orderly arrangement his collections left little to be desired.

For any adequate knowledge either of the Coleoptera of Japan or of the family Histeridæ, to whose study he devoted the last thirty years of his working life, his collection will always be indispensable, and the British Museum is to be congratulated on its acquisition.

I am indebted to Miss J. S. Upton, niece of Mr. G. Lewis, and to Mr. S. W. Arrow, F.E.S., of the Natural History Museum, for much of the information in this notice. [Stanley Edwards.]

Joseph Jackson Lister, born 1857, died February 5th, 1927, was the second of the name, the first, his grandfather (1786–1869), being the well-known physicist and microscopist whose improvements in microscope technique made his sons' researches possible. His father was Arthur Lister, whose researches on the Mycetozoa are classical, and his uncle, Lord Lister, revolutionised modern surgery. Brought up in such an environment, his interests early turned to biology, and, even as a boy and later an undergraduate at Cambridge, he assisted his father in his researches. Of a Quaker stock he was naturally well educated, serious and determined in all he did throughout his life. He knew his British birds, insects, and plants as few British zoologists now do, and he might have become a noteworthy water-

colour artist save that he clung to a certain literalness in all his work.

As a student at Cambridge, Lister, with his peculiar aloofness and his strong character, was a conspicuous figure. He took his degree in 1879, and he stroked his college (St. John's) boat from 1878 to 1882. He was even then, as in later life, the close friend of Alfred Newton and Michael Foster, of Francis Maitland Balfour, of Adam Sedgwick, of Garrod, of Sollas, and a host of other young biologists. He lectured to Bateson, Weldon, and another generation on Vertebrates, but he soon gave this up, qualifying in medicine from University College, where he obtained the Lister Gold Medal in Surgery.

In 1886, for reasons of health, he left England for four years' travel in sailing-ships, but principally in H.M.S. 'Egeria,' a Survey vessel. He wandered over much of the Indian and Pacific Oceans, making collections wherever he went—Australia, Tonga, Phœnix Islands, Christmas Island, and Seychelles,—subsequently publishing accounts of their birds, and often their geology and natives as well. He saw Falcon Island shortly after its formation by submarine eruption, and he predicted its fate. His description of the geology of the Tongan Archipelago showed the association of vulcanism with elevated reefs and with growing reefs; this really killed the then generally-accepted belief in that universal tropical subsidence required by Darwin's coral-reef theory. His deep reverence for and loyalty to Darwin led him to doubt his own conclusions and later to combat similar evidence, collected in the Fiji and Solomon Islands as well as in many other parts of the East Indies.

Returning to Cambridge, Lister was appointed by Newton Assistant to the Superintendent of the Museum of Zoology in 1891 and Demonstrator in Comparative Anatomy in 1894; but his work was entirely under Adam Sedgwick. He was a fine teacher, for he had seen nearly every animal described living in its natural environment, and he loved to talk of their habits. For a few years he gave a short course of lectures on Comparative Osteology, devoting his spare time for over a year to its preparation. In this same period he wrote the articles "Mycetozoa" for the 'Encyclopædia Britannica' and for Lankester's 'Treatise on Zoology,' and the Introduction to the Arthropoda, the Crustacea, and Xiphosura, three sections in Sedgwick's text-book; every fact in all of these, which he could check, he confirmed, this thoroughness being part of his character. His main researches were on the calcareous Foraminifera, and his careful investigations of the life-history of *Polystomella*, showing that its dimorphic forms were alternating generations, procured his election to the Fellowship of the Royal Society in 1900 and to the Presidentship of Section D of the British Association in 1906. He was elected Fellow of his College in 1899, and there he resided until his marriage to Miss Marryat, in 1911, when he moved to Bateson's house at Grantchester, obtaining great happiness in his

home-life, in his garden, in his studies of variation in butterflies, and in his observations on living nature. He was peculiarly interested in Wicken Fen, for which he served as Treasurer for many years, projecting the systematic study of its natural history now being carried out. By his death we lose one of the last of the genuine old-world naturalists, as contrasted with the more highly specialised and usually narrower product of the present day. [J. S. G.]

George Taylor Porritt died on January 21st, 1927, at Huddersfield, his native town and his life-long residence, at the ripe age of 79 years. From his boyhood he was a devoted student and ardent collector of insects, in which his interest never failed until the end. As he very soon became a field-entomologist of exceptional capability, his knowledge of the insect-fauna of that productive county Yorkshire was probably unrivalled. But his attention was by no means confined to his native county, as nearly all the classical British collecting-grounds were visited by him during the course of his long life, the result of his efforts being a collection of our Lepidopterous insects almost without a rival for completeness and beauty of preservation, a part of which at least is likely to find a permanent home in the Tolson Memorial Museum at Huddersfield. In his later years he commenced the study of the less-favoured Orders Neuroptera (*sensû Linneano*), Orthoptera, and Trichoptera, which he pursued with equal energy and success, and he was recognized as one of the chief living authorities on the last-named insects.

As he possessed a special talent for the rearing and description of Lepidopterous larvæ, he contributed largely to the early volumes of William Buckler's great work, 'The Larvæ of the British Butterflies and Moths,' commenced under the auspices of the Ray Society in 1886. The editorship of the last five of the nine volumes of the work devolved upon Porritt, by whom it was brought to a successful conclusion in 1901.

His 'List of Yorkshire Lepidoptera,' one of the most compendious and useful works of its kind, was published in the 'Transactions of the Yorkshire Naturalists' Union' (1883–1886), and was brought up to date in 1904. The articles on the Lepidoptera, Trichoptera, Neuroptera, and Orthoptera in the Entomological Section of the 'Victoria County History of Yorkshire' are also from his pen. Perhaps he was best known, however, by his numerous and valuable contributions to the study of Variation and Melanism in Lepidoptera, especially as exhibited in the insects of his native county. A highly important and suggestive paper on "Melanism in Yorkshire Lepidoptera" was read by him at the meeting of the British Association at York in 1906, and was published in the Report for that year. From 1905 until his death he was one of the editors of the 'Entomologists' Monthly Magazine,' and he was intimately associated with that excellent northern periodical, 'The Naturalist,' from its inception in 1875.

At the time of his decease Porritt was one of the oldest Fellows of the Linnean Society, his election dating from December 5th, 1872. Two years previously he had been elected a Fellow of the Entomological Society of London, and in 1898 he became a member of that small and select body, the Entomological Club. He was the first Secretary, and for many years President, of the Yorkshire Naturalists' Union, as well as a member of practically all the Natural History associations of the county.

He was a man of genial address and generous and sterling character, and his death leaves a gap in the ranks of British entomologists which will not readily be filled. [J. J. W.]

A long-lived and energetic botanist has passed away in the person of Dr. Ludwig Radlkofer, aged 97, on the 16th February, 1927. He was born in Munich on the 19th December, 1829, took the degree of M.D. at that University in 1854, and, after studying under Sendtner and Martius during 1848–54 in his native city, he worked under Schleiden at Jena 1854–55, taking his Phil.D. there in the latter year. He began his scientific authorship in his 'Die Befruchtung der Phanerogamen,' Leipzig, 1856, and his last botanical article was printed a few months only before his death—a period of seventy years. In 1857 he produced his 'Der Befruchtungsprocess im Pflanzenreich,' and after a serial article on Parthenogensis in that year, he brought out a volume on it in 1858. His favourite family of Sapindaceæ began to draw his attention: he published in the 'Abhandlungen' of the Bavarian Academy his "*Sarjania*: Monographie der Sapindaceen-Gattung," 1875, with a supplement in 1886. The fiftieth meeting of German naturalists took place in Munich in 1877, to which he contributed two papers on sapindaceous subjects. "Ueber *Cupania*" appeared in the Sitzb. of the Bavarian Academy in 1879, and a paper on the species, which are found in the Dutch East Indies, in the same year at the Botanical Congress in Amsterdam.

Another topic which he had at heart was the "anatomical" method of examining plants—'Ueber die Methoden in den botanischen Systematik, insbesondere die anatomische Methode. Festrede,' München, 1875. As far back as 1868 he referred to this topic at the Norwich meeting of the British Association as "On the Structural Peculiarities of certain Sapindaceous Plants," and, again, in 1885, at the Aberdeen meeting, "On the Application of the Anatomical Method to the Determination of the Linnean and other Herbaria." He was very anxious that his pupil, Dr. Hans Solereder (1860–1920) should be allowed to examine the Linnean herbaria "anatomically," a proposal which would have involved so much damage to the specimens that the Council refused permission. The old collections of Sloane at the British Museum were to be subjected to examination, which also could not be countenanced.

To the end of his life his interest in Sapindaceæ never waned; and excluding other smaller works on those plants, we must refer to the account of the Brazilian species in Martius, Fl. bras. vol. xiii. 3 parts (1892–1900), and a synopsis of the family in Engler and Prantl, Naturl. Pflanzenfamilien,' Teil III. v. S. 277–366 (1895); in this last year he issued his monograph of the genus *Paullinia* in the Bavarian 'Abhandlungen.'

He was Professor of Botany in the Munich University from 1863 to 1892, and enjoyed the distinction of membership in many foreign Societies; he was elected a Foreign Member of our Society on the 6th May, 1897. [B. D. J.]

With the death of Mr. James Rodway, F.L.S., of Georgetown, British Guiana, passes one of the last of the naturalists of the mid-nineteenth century school—a school which may perhaps claim Bates, Belt, Wallace, and even the 'Cruise of H.M.S. "Beagle"'; for its followers were still naturalists in the original meaning of the word, and regarded zoology, botany, mineralogy, and ethnology alike as their province.

Rodway went out to Guiana in the early 'seventies to take up a business appointment; but his tastes for the natural sciences soon asserted themselves, and for many years he devoted himself to the formation and arrangement of the Museum of Natural History and Anthropology, of which he became Curator. Nothing pleased him more than to display the collections, and he was untiring in help to those interested. The present writer remembers with pleasure such visits to his museum in 1922, when, in spite of advanced age and fifty years spent in the Tropics, the Curator's memory and gift of exposition, like his courtesy and enthusiasm, were unimpaired.

Rodway was primarily a botanist, and his study, 'In the Guiana Forest' (London, 1895), gives a vivid and accurate picture of tropical vegetation; but he was also a keen zoologist, and his knowledge of the folk-lore and customs, both of the aboriginal Indians and of the negroes of the colony, was very exhaustive. One of his last essays is an account of Indian "beenas" or charms, contributed to 'Tropical Wild Life' by Beebe, Hartley, and Howes (New York, 1915); and it is indeed to be hoped that any notes that he may have left on kindred subjects will be suitably edited and published.

Rodway was not only a naturalist, but a historian and antiquary, and his 'History of British Guiana,' in three volumes, published in 1891, 1892–93, is a standard book on the development of the colony. In 1912 he published a shorter history of all three Guianas, 'Guiana, British, Dutch, and French.' He wrote in a pleasant readable style, and possessed a gift for picturesque description which served him in good stead in depicting the wonderful country to which he devoted his long life. [H. H. B.]

Mr. Harold Russell died at Shere, in Surrey, on 22nd August, 1926, from pneumonia. He was born on 23rd July, 1868, and

was the eldest son of the late Lord Arthur Russell, M.P., and Laura, daughter of Viscount de Peyronnet. He was educated by his father and at Baliol College, Oxford.

In 1894, Russell was called to the Bar—Inner Temple,—and practised before the Railway and Canal Committee and other Parliamentary Committees, as well as in the Common Law Courts and on the Midland Circuit. He was appointed Recorder of Bedford in 1912, and during the War, being over age, worked in various capacities at the Admiralty and Foreign Office, where his knowledge of European languages and diplomatic talent were of great value, and, finally, was appointed British Secretary of the Anglo-German Mixed Arbitral Tribunal under the Treaty of Paris.

Russell had a great love of country life—hunting and fishing, and more especially flowers and birds. He took an interest in Nature Reserves, wrote several papers on the subject, and it was mainly through his activities that a Committee was appointed by Lord Crawford, First Commissioner of Works, to examine the possibilities of sanctuaries for wild birds in the Royal Parks. Russell served on the Committee, and contributed annually an interesting report on the results of his own observations, and those of others, on the birds of the London Parks.

He was the author of several works, which, apart from professional publications, include 'Chalkstream and Moorland' (1911) and 'The Flea' (Cambridge Manuals of Science), 1913. He also contributed several articles on Diptera to the 'Journal of the Bombay Natural History Society.' These, together with the last-named book, were admirable pieces of work, and show how an amateur, without any special training or study, can master a difficult subject—doubtless, his legal training was responsible to some extent for this.

In 1896 he married Lady Victoria Leveson-Gower, daughter of the second Earl Granville, who, together with one son and two daughters, survive him.

He joined the Linnean Society in 1919, and was a Fellow of the Zoological Society and Member of the British Ornithologists' Union. [N. B. Kinnear.]

Although not particularly well known to botanists, Mr. T. W. Sanders was an outstanding figure in the horticultural world for nearly half-a-century. Born at Martley, Worcestershire, in 1865, his earlier years were spent in various gardens, including Versailles, where he obtained that intimate knowledge of horticultural practice that proved invaluable in his later years.

While still a young man he had charge of a considerable establishment at Lee, and it was during his occupancy of this onerous position that he wrote frequently for the horticultural press. He was emphatic without being dogmatic, and his terse descriptions of plants and successful methods of cultivating them proved that above all else he was "a good practical gardener." But his descriptions were always pleasant reading, and thus made

a greater appeal to amateurs than did the severely plain and practical observations of so many professional gardeners of that time. He had the genius to foresee the difficulties amateur gardeners were likely to experience in their cultivation of flowers, fruits, and vegetables; he also possessed the knowledge of how best to avoid or overcome such difficulties. His success as a writer led to an invitation to become editor of 'Amateur Gardening,' a journal founded and previously edited by Mr. Shirley Hibberd, and the property of Messrs. W. H. and L. Collingridge of the *City Press*. This invitation was accepted, and he held the position with great success for a period of forty years—until his death on the 13th October, 1926.

Sanders's editorial experiences emphasised the needs of amateur gardeners, and to supply these needs in some measure he established the National Amateur Gardeners' Association and was the driving force that made it an unqualified success; the meetings were crowded with enthusiasts who found in the President a man who resolved their difficulties without ridicule or the assumption of superior knowledge or intelligence. This success and the hurricane of questions with which he was assailed led Mr. Sanders to become author as well as editor. His 'Encyclopædia of Gardening' was an immediate success when issued, and nineteen editions (extending altogether to about 250,000 copies) indicate its value to many horticulturalists other than the suburban amateur gardeners. Other books he wrote include 'The Flower Garden,' 'Vegetables and their Cultivation,' 'The Amateur Greenhouse,' 'Roses and their Cultivation,' 'Bulbs and their Cultivation,' 'Rock Gardens and Alpine Plants,' 'Popular Hardy Perennials,' 'The Book of the Potato,' 'The Alphabet of Gardening,' and 'Fruits and their Cultivation,' an enlarged edition of this last appearing about a month before the author's death.

Sanders had also a practical acquaintance with agricultural pursuits and at one time edited 'Farm and Garden.' He also edited a series of handbooks on live stock and market gardening, and it was while engaged in this work, and still conducting 'Amateur Gardening,' that he visited Sweden to study horticultural and agricultural procedure. His reports on these subjects won the approval of the Swedish Government, who recognized his services by awarding him the honour of Knight of the First Class of the Royal Order of Wasa.

Sanders had an extraordinary capacity for work; he was unassuming, kindly, and considerate, and during the whole of his life he never failed to lend a helping hand to those in need of any assistance he was able to render. [C. H. Curtis.]

Charles Sprague Sargent, Foreign Member of the Society, was descended from William Sargent, who migrated to America from Gloucester in the 17th century. He was born at Boston (Mass.) on 24th April, 1841, and graduated at Harvard University in 1862, after which he served in the Federal Army till 1865,

when he retired with the brevet rank of major "for faithful and meritorious service." Throughout his long life he was closely connected with Harvard College, where he was Professor of Horticulture in 1872 and 1873. The main work of his life was in forestry and arboriculture; and his services to his own country and to the world at large were eminent in both. The Arnold Arboretum, of which he was Director from its formation in 1872 till his death in 1927, owed everything to his energy, originality, knowledge, and liberality. This unique garden was named after James Arnold, a New Bedford merchant, who left 104,000 dollars for its endowment and the purchase of the site, which originally covered 112 acres, but has been enlarged to 275 acres. It is situated within five miles of Boston, and preserves for ever a beautiful bit of New England, including a portion of the original conifer forest of magnificent old hemlock spruce trees, with high cliffs and rolling hills. It is remarkable amongst botanic gardens in being mainly confined to the cultivation of trees and shrubs, of which it includes almost all the species of the whole world that could be raised and flourish in the open air. The Arboretum houses a splendid library and an extensive herbarium.

Both Sargent and his assistants have done much research in the domain of descriptive botany, and he was the author or editor of many important books, notably 'The Silva of North America,' published 1891–1902 in 14 quarto volumes illustrated with 740 plates, a monumental work, which is the standard authority on the native trees of the United States and Canada. His 'Manual of North American Trees,' the second edition of which appeared in 1922, deals with the same subject in one volume. He also published 'Trees and Shrubs' (two volumes), 'Woods of the United States,' etc. He edited the 'Journal of the Arnold Arboretum,' now in its eighth annual volume.

Sargent was no arm-chair botanist. He travelled extensively in America, and in Manchuria, Japan, and China, and in this country and on the continent of Europe. He visited Japan in 1892, the results on his observations on its native trees being published in his 'Forest Flora of Japan' in 1894. He organised and financed Mr. E. H. Wilson's botanical explorations in China, Formosa, Japan, and Manchuria, which have been so fruitful in adding to our knowledge of the arboreal flora of eastern Asia, and in the introduction to cultivation in Europe and the United States of a host of new and beautiful trees and shrubs. He edited 'Plantæ Wilsonianæ,' which enumerates with descriptions of new species the woody plants collected by Wilson prior to 1913. Sargent enriched the Arnold Arboretum by these and other collections; and by exchange and gift he added much to the great botanical establishments of Kew, Edinburgh, Glasnevin, Paris, etc. Furthermore, large collections came to Sargent from all parts of the American continent, greatly increasing the knowledge of the flora of the Western Hemisphere.

Sargent's main patriotic work lay in the domain of forestry.

He was chosen by the American Association for the Advancement of Science to make a detailed survey of the forests of the country, the first step taken in Conservation by the Federal Government. He was Chairman in 1896 of the U.S. Commission on Forest Policy, which saved the mountain forests in New York State, and was the effective beginning of the National Forests, which now cover an area of over 150,000,000 acres. Sargent always advocated the creation of the great National Parks; and this policy and progress generally in America in horticulture and arboriculture were greatly aided by 'Garden and Forest,' a journal which he issued weekly for ten years, 1887–1897. For his services to forestry alone he deserves to rank high amongst the far-seeing statesmen of the nineteenth century.

Sargent lived a long and healthy life, and his fatal illness lasted only a fortnight. Previous to this he was actively engaged every day in the Arboretum. His courtesy and kindness endeared him to many friends both at home and abroad. With him has passed away the last of the great veteran botanists who attained world-wide fame by extensive travels and enormous labour in the cause of Science. He died on 22nd March, 1927, at Holm Lea, near Brookline, a beautiful estate, which was a wonderful example of his practical ability as a horticulturist. There he had for many years dispensed lavish hospitality to foreign botanists.

[A. Henry.]

Georg Ossian Sars was born at Florö, near Bergen, in 1837, and died at Oslo on 9th April, 1927, a few days before he would have completed his 90th year. He was the second son of Michael Sars, who, at the time of his birth, was pastor of Florö, but was already well known for his researches on marine zoology, and was later appointed Professor extraordinarius of Zoology in the University of Christiania. The Sars family were of a seafaring stock, coming from North Germany and perhaps originally from Northern France. Ossian's mother was a sister of the distinguished Norwegian poet and critic, J. S. Welhaven. After the family removed to Christiania, Ossian became a student at the University and began the study of medicine, but his tastes were already developing in the direction of natural history. He accompanied his father on his zoological excursions, and helped him by making drawings of the animals they collected. His artistic talents were so marked that there was some talk of his going to Germany to study painting and music, but his mother seems to have had a clearer perception of her son's real calling, and he devoted himself more and more to zoology. A paper by the Swedish zoologist, Lilljeborg, having directed his attention to the freshwater Entomostraca, he bought a microscope and began to study these minute Crustacea. His first publication was a short paper, "On the Cladocera occurring in the neighbourhood of Christiania," in the 'Proceedings of the Scientific Society of Christiania' for 1861, and in the following year he was awarded the Royal Gold Medal of the University for

a thesis on the same subject. In 1867 he published the first part of a projected 'Histoire Naturelle des Crustacés d'eau douce de Norvège.' This part, dealing with the Malacostraca, was illustrated by ten plates engraved on copper, which have hardly been surpassed in the iconography of the Crustacea.

In 1864 Sars was sent by the Norwegian Government to investigate the cod fishery at the Lofoten Islands, and began a series of researches which marked the opening of a new epoch in the scientific study of sea fisheries. At that time it was generally assumed that all fishes deposited their spawn at the bottom of the sea. During his first winter at Lofoten, Sars made the surprising discovery that the eggs and young of the cod were pelagic, floating freely at the surface of the sea and drifting with winds and currents. He was later able to show that the same is true of nearly all the important food-fishes (the herring is a notable exception), and to apply this knowledge to explain their distribution and seasonal migrations in Norwegian waters. Many investigators in all civilized lands have since laboured to extend our knowledge of the life-histories of food-fishes, but it is not likely that many of them have ever read the little paper, "Om Vintertorskens Forplantning og Udvikling," in which Sars announced his discovery to the Scientific Society of Christiania in 1865.

Sars's fishery investigations were continued for many years, but side by side with them he carried on, partly in collaboration with his father, faunistic and anatomical studies on the most diverse groups of marine animals. Already, in 1864, he discovered at Lofoten the remarkable stalked Crinoid, which was later described by the elder Sars as *Rhizocrinus lofotensis*, and in the following year he dissected and described a large Rorqual that had been cast ashore. In this and a series of later contributions on whales he published what are probably the most accurate drawings that have ever been made of these unwieldy animals. Michael Sars died in 1869, and in the following year his son became a teacher of zoology in the University of Christiania, succeeding to the Chair of Zoology on the death of Professor Rasch four years later. Several of his students have recorded that the lucidity of his exposition and his skill at the blackboard made his lectures a delight to his classes. Like his father, he early became a convinced evolutionist, and it was partly his admiration for Darwin's work that led to his adopting the English language for all his more important later works.

In 1875–76 Sars made a prolonged journey to the Mediterranean, visiting, among many other places, Naples, where he made the acquaintance of Anton Dohrn and worked in the recently-founded biological station. On his return he took part in organizing and carrying out the "Norwegian North Sea Expedition" in the 'Vöringen' in the years 1876–78, and contributed several of the reports in which the results of that important expedition were described.

Among all the groups of animals which Sars's researches illuminated, the vast and varied class of Crustacea received most of his attention. The long series of papers, memoirs, and monographs which he devoted to the various Orders, from Branchiopoda to Decapoda, are abundantly illustrated by his own pencil. Perhaps only those who have attempted similar work can appreciate fully the detailed accuracy of these drawings and the incredible labour that their preparation must have involved. As Sars's supremacy in this line of work became known, he was invited to report on the collections made by many foreign expeditions. To the reports of the 'Challenger' Expedition he contributed three memoirs—on the Schizopoda, Cumacea, and Phyllocarida,—and one of his last works was the description of the rich collections of oceanic Copepoda obtained by the expeditions of the Prince of Monaco. His *magnum opus*, however, was 'An Account of the Crustacea of Norway,' of which the publication was begun in 1890, and of which the ninth volume was incomplete at the time of his death. The published volumes deal with the Amphipoda, Isopoda, Cumacea, Copepoda, and part of the Ostracoda, and are illustrated with no fewer than 1159 plates. Meanwhile, he was writing lengthy series of memoirs on Crustacea from the Caspian Sea, Lake Baikal, and Lake Tanganyika, and on species obtained in cultures from dried mud sent to him from Australia and South Africa. The last paper received from him only a few days before his death dealt with freshwater Copepods from South Africa.

Sars was of a shy and retiring disposition, and in his later years lived almost the life of a recluse, absorbed in his work. His one recreation was music, of which he had a keen appreciation. In his younger days he was fond of playing on the violin the old folk-dances and songs of his native land. We are told that he played entirely by ear, but since Ole Bull found it worth while to listen, he can have been no mean performer. He travelled little abroad and was known personally to few of his zoological colleagues in other countries, although he was most courteous and obliging to those who sought his help by correspondence.

Sars was an honorary member of many foreign Academies and scientific Societies. We of the Linnean Society may be proud to think that he was one of us and that we gave him the highest honour in our power when he received the Linnean Medal in 1910.

This notice owes much to Dr. O. Nordgaard's charming little book, 'Michael og Ossian Sars,' published in the series "Nordmaend" in 1918. [W. T. C.]

Miss Matilda Smith, the well-known botanical artist of Kew and an Associate of the Society, was born in Bombay on July 30th, 1854, and died at Kew on December 29th, 1926. She was the second daughter of James Smith, of Sydenham, and on her

mother's side she came of East Anglian stock and was connected with the eminent East Anglian botanist, Dawson Turner, and through him with the Hookers, her grandmother being Mrs. Dawson Turner's sister, and Sir William Hooker's wife being Dawson Turner's daughter.

Although Miss Smith's illustrations are found in many floras and other botanical works, she is perhaps best known for her work for the two Kew periodicals, the 'Botanical Magazine' and the 'Icones Plantarum,' of which she prepared practically all the drawings for 34 and 40 years respectively. She was invited to come to Kew by Sir Joseph Hooker in 1877, when he lost the services of Walter H. Fitch as colour artist for the 'Botanical Magazine,' and her drawings were of such merit that shortly afterwards they commenced to appear in the 'Botanical Magazine.' She shared this work with Miss Barnard, Lady Thiselton-Dyer, and others till 1887, when the volume for that year consisted exclusively of her drawings, and she continued artist for the Magazine till shortly before her retirement, when it was temporarily suspended. Her sole responsibility in connection with the 'Icones Plantarum' was even longer, commencing in 1881 and lasting (with the exception of a volume of ferns and a few odd plates) till her retirement in 1921. During the whole of this period Miss Smith was both artist and lithographer.

Her talent as a botanical artist was naturally largely drawn upon by many botanists for illustrating various works. Mention need only be made of Hemsley's 'Report of the "Challenger" Expedition,' Balfour's 'Botany of Socotra,' Collett's 'Flora Simlensis,' and Cheesman's 'Illustrations of New Zealand Plants.' Her drawings for Collett's Flora have often been regarded as some of her best work.

Miss Smith's work was marked by great conscientiousness. Her drawings were botanically of very high quality, and she possessed the art of concentrating on important and essential features and not wasting time on irrelevant details. It was this fact, coupled with her industry, which enabled her to accomplish such an immense amount of work.

Being so long associated with the Kew Herbarium, Kew had a real place in her affections. She took a deep interest in all that concerned its affairs, not only in the Herbarium, but in the various activities in the Gardens proper, and in 1916 she was elected President of the Kew Guild, a Society which aims to include all past and present Kewites. In 1921 she was elected an Associate of the Linnean Society, and shortly before her death the Council of the Royal Horticultural Society awarded her a Silver Veitch Memorial Medal with a sum of £25 in recognition of her work in connection with the 'Botanical Magazine.' [A. D. C.]

Until war conditions in 1914 made railway travelling tedious and irksome, the Rev. Thomas Roscoe Rede Stebbing was one of the most constant attendants at the General Meetings of the

Society; but when more peaceful times brought in some improvement, it was too late to make use of it, and the habit once broken was never resumed.

Our late Fellow was born in Euston Square on the 6th February, 1835, the seventh child of thirteen born to the Rev. Henry Stebbing (1799–1883); he entered King's College School, then still in the Strand, passing to Lincoln College, Oxford, and later to Worcester College, succeeding brilliantly in his academic career, and in 1859 he took orders, being ordained by Samuel Wilberforce, at that time Bishop of Oxford. He took up tuition as a master at Radley and at Wellington, and later at Worcester College, of which he was Fellow and Tutor, and in due course Vice-Provost and Dean.

In 1863 he took a house for pupils at Reigate, and in 1867 he married the youngest daughter of William Wilson Saunders, Treasurer of our Society from 1861 to 1873 and an enthusiastic field-naturalist. Having thus become interested in natural science, Stebbing intended to confute the theories of Darwin, but, upon reading 'The Origin of Species' as a preparation, he entirely changed his opinions and became a convinced evolutionist. He and his wife removed to Torquay upon their marriage, and there passed the first ten years of their union; in 1871 a severe review in the *Times* of Darwin's 'Descent of Man' was answered by our Fellow in *Nature*, which gave to his name a certain prominence; in 1873 he published an anonymous paper, "On some Gradations in the Forms of Animal Life."

In 1877 he migrated to Tunbridge Wells, and increasing calls upon his attention for reporting upon the results of scientific expeditions such as those of the 'Challenger' put an end to his tutorial business, and henceforward his whole strength was given to scientific work. Here for the remainder of his life he lived in a house on the Common, Ephraim Lodge, busy on his work, and taking a rest by change; whilst my colleague will recount the number and value of his crustacean writings, I will only mention that he issued 'Longinus on the Sublime' in 1867 and 'The Naturalist of Cumbrae' in 1891, and many essays in serials.

On the 5th December, 1895, he became a Fellow of the Society, served on the Council from 1900 to 1907, was Zoological Secretary 1903–7, and Vice-President for two years previous to his secretarial post. The Linnean Medal was awarded to him in 1908. He had in earlier years strenuously advocated the admission of women into the Society, and after three counsel had agreed that the Royal Charter of 1802 gave no power to admit women, he was earnest and active in promoting the issue of a supplementary Charter, the granting of which on the 8th April, 1904, was followed as soon as might be by a number of women taking advantage of the open door—amongst them Mrs. Stebbing.

During the last years of his life his sight grew dim, but he continued to the last to walk on Tunbridge Wells Common, with

two sticks, even venturing to cross the roads unaided. He passed quietly away on the evening of the 8th July, 1926; the funeral service was performed at St. Paul's Church, Rusthall Common, where he used, when requested, to officiate; but as the churchyard was inadequate, the burial was in the public cemetery at the other end of the town.

Our President was unable to attend, but the present writer went at his request to represent the Linnean Society; Mr. Walter Heape represented the Royal Society. [B. D. J.]

Stebbing's first contribution to the study of Crustacea was published in 1873 and his last in 1924. From the fifty-two annual volumes of the 'Zoological Record' that cover that interval of time, a list of his writings might easily be compiled which would convey some impression of his ceaseless industry and the wide extent of his studies; but it would not reveal the infinite pains which were taken over every detail, however trivial, so that in the whole long list you will hardly find a wrong or an incomplete bibliographical citation. Of the thousands of drawings that illustrate his papers, the only complaint that can be made is that they are too true to nature in the sense that they sometimes reproduce irrelevant details or accidents of preparation as prominently as the essentials of structure. Some of us may have been tempted to say in our haste that Stebbing was less interested in the Crustacea than in their names, but in calmer moments we had to admit that it was he who had taught us what zoological bibliography meant. It was easy to be erudite on Amphipoda with his 'Challenger' report and his 'Tierreich' volume at hand.

Stebbing gave much attention to questions of nomenclature. He was an uncompromising advocate of the rule of priority, but was not prepared to accept the decisions of an international commission, and said so plainly. Whatever may be thought of the expediency of the changes he introduced, his arguments were unanswerable once the rule was admitted.

Many of our Fellows will retain pleasant memories of Stebbing's slight but dignified figure, his charming old-fashioned courtesy and his whimsical sense of humour. Some, like the present writer, will remember especially the patience and kindness with which he placed his endless stores of learning at the service of the most ignorant. [W. T. C.]

Mrs. T. R. R. Stebbing.—It was in November 1904 that the privilege of Fellowship was granted to women by the Linnean Society, and on the 19th January, 1905, the first women Fellows were received by the President, Professor Herdman. One of that band was Mrs. Stebbing, the wife of the Zoological Secretary, the Rev. Thomas R. R. Stebbing.

Mrs. Stebbing's interests were botanical, and we get a glimpse of her activities in an autobiographic sketch contributed by her husband to the 'Transactions and Proceedings of the Torquay

Natural History Society,' iv. pp. 1–5, 1923. He there tells us of his taking up his residence at Reigate in 1863, and becoming "acquainted with William Wilson Saunders, F.R.S., whose household might long be described as a very nest of naturalists and whose youngest daughter I married in 1867." Wilson Saunders was a keen student of botany, and in 1871 published a first series of coloured figures of British Hymenomycetes.

Mrs. Stebbing in those early days was chiefly interested in flowering plants, and one of her schemes was to illustrate the British flora by water-colour drawings. The bulk of these were destroyed in a fire, but some few were unhurt and have been judged of great beauty. Mr. Stebbing has thus referred to the calamity:—"To meet the vast accumulation of unbound scientific memoirs, my wife, though fully engaged with botanical researches, found time to learn bookbinding. That one house was burned down (in 1881) and another subsequently enlarged in the vain hope of finding room to arrange books and specimens, are incidents now almost forgotten, though absorbing enough in occurrence."

Mrs. Stebbing's interest was not confined to flowering plants: I can vouch for her desire to determine coloured drawings of the larger fungi, and of her wish to become acquainted with lichenology. Her quiet and kind presence was very welcome at the Society's meetings for a number of years, and when she ceased attendance the gatherings lacked something of friendliness for those who had the privilege of her personal acquaintance. The war had intervened, and Tunbridge Wells, where her home was for many years, was too far away in those dangerous troubled years. It was with great regret that we learned of her death on the 21st January, 1927. She had not long survived her husband, the companion of so many years. [A. Lorrain Smith.]

Born at Hingham, in Norfolk, in 1864, Charles Turner, the son of the Head Master of Hingham Grammar School, was educated at that school, and then proceeded to Downing College, Cambridge. His training in pharmacy he obtained at the Manchester School of Pharmacy, passing the major examination of the Pharmaceutical Society in 1886. In 1890 he became Lecturer in the Manchester School of Pharmacy, and Principal of that School in 1895, continuing to hold that post until 1912, when ill-health compelled him to resign. Nevertheless, he retained the post of Lecturer in Botany until his death in September 1926. Turner was elected Fellow of the Chemical Society in 1898, and contributed several papers to the memoirs of that Society. His main interest, however, was centred in botany, and more particularly in the investigation of freshwater algæ, of which he discovered several new species. He was in correspondence with most of the European authorities on algæ, and published several papers on the Life-history of Microscopic Algæ. He contributed a paper to the Linnean Society on *Staurastrum Dickiei*, and was elected a Fellow of the Society in 1922.

Turner was an active member of the Manchester Microscopic Society, occupying the position of Vice-President from 1899 to 1914. He delivered many addresses to that Society during his long connection with it, and was constantly appealed to by members working on microscopic pond-life. He was of a modest disposition, ever ready to assist his fellow-workers and friends, and will be greatly missed among all naturalists in the Manchester district. [F. E. W.]

The passing of James Udale at the age of 76 removes another of that old school of gardeners who are still remembered for what they did to develop horticulture during the Victorian era. James Udale's name is associated with the other gardeners who began life in humble circumstances, received their early training in the gardens of the stately homes of England, educated themselves as they went along, and by sheer force of energy and ability made names for themselves in the world of horticulture. Beginning his working career under Barron, Udale moved in 1865 to the Garston Vineyard, Liverpool, which was famous as being the largest grape-growing establishment in the country; and he followed the custom of the young men of his day in stopping long enough in one place to get experience and then moving on to gain further knowledge. It was while he was serving as foreman at Lilleshall Hall, Newport, Salop, that Udale's ambition led him to apply for admission to Kew. From a foremanship there he became head gardener at Shirecliffe Hall, Sheffield. Other headships followed, and when the Technical Education Act came into operation in 1891, grants were made to county authorities for purposes of technical education, and Worcestershire was one of the first counties to acquire the services of an instructor to teach the science and practice of horticulture. Udale was appointed, and thus was one of the pioneers in the work of horticultural education which has now a widespread influence all other the country. For thirty years, and until his retirement, he laboured in Worcestershire, lecturing, advising, and demonstrating, and perhaps his happiest hours were spent in the County Experimental Garden at Droitwich, which he planted with trees and kept detailed records of the crops they bore over a long period of years. Keeping statistics was almost a passion with him, and the figures he compiled giving the results of the trials and experiments he conducted were voluminous and given in careful detail. In addition, he was the author of several handbooks, including one on pruning, and he was a frequent contributor to the horticultural press. The writer can recall many interesting chats with Udale in the experimental garden, which seemed to be peculiarly his own, and the last few years of his life were spent in peaceful retirement close by. Other old Kewites may have achieved greater fame, but amongst the many who have passed through that famous garden there were none who were prouder of its traditions or served the cause of horticulture more faithfully than James Udale.

[G. C. Hollingworth.]

Alfred Oston Walker was born in 1832 and died in 1925, aged 93 years. Throughout the greater part of this long life he was actively engaged in the conduct of a successful business, but the nature of his mind was such that he was able to develop strong interests in very different directions. As a man he was very likeable, very hospitable and fond of the society of other professional and business men who were really in earnest with regard to their occupations. He was acute in his criticisms and judgments, intolerant of snobbery in any form, humorous and sarcastic in a kindly way, and advanced beyond most men of his class in his views on social and political questions. He was a man of wide reading and culture, and he became an accomplished musician in middle life, reading scores well and playing various instruments—in particular, the viola.

He was an amateur zoologist in the sense that he never held any salaried university or museum appointment; but the quality of his work was entirely that of the professional man with a long University career. Without doubt, he would have become very well-known had it been his fortune to adopt Science as a career; as it was, he did become a recognized authority in the branch of zoology that he studied, and he accomplished a large quantity of work characterized by all the marks of the fastidious and successfull professional investigator.

He was a systematist with a particular knowledge of the Crustacea and, in special, the Amphipoda. His interest developed from the early 'eighties, when he became associated with Professor W. A. Herdman in the formation of the Liverpool Marine Biology Committee. The first object of this small body of amateur and professional biologists was the description of the fauna and flora of the Irish Sea, and Walker wrote the Reports on the Higher Crustacea that appeared in the volumes published by the Committee. But his interests extended far beyond this local investigation, and the results were a series of papers published in the Transactions and Journal of the Linnean Society, the Annals and Magazine of Natural History, the Reports of the National Antarctic Expedition of 1901–4, the Royal Society Report on Professor Herdman's investigations of the Ceylon Pearl Fisheries, Professor Stanley Gardiner's Reports on the Fauna of the Maldive and Laccadive Archipelagoes, and the Special Bulletin of the Liverpool Museums dealing with the investigation of Sokotra and Abd-el-Kuri that was edited by Dr. H. O. Forbes. He also published results in the Proceedings of the United States National Museum and in the Reports of the British Association. His last papers were published during the war period, after he had retired and was living at Maidstone, and when he was making arrangements for the disposal of books, papers, and collections.

A. O. Walker was probably one of the last of a class of scientific investigators that is about to pass out of existence. Long ago it was mostly the medical men that did research on natural history subjects, but in the 19th century, in particular, many

others (artisans, professional and business workers) made of their hobbies specialized investigations that attained results which have long been incorporated into the literature of natural science. It is fortunate that systematic zoology and botany can be successfully studied by those who have other obligatory occupations—without the costly equipment of the modern scientific laboratory and with results that are entirely satisfactory. And so a large part of our knowledge of the species of plants and animals has been attained through the labours of men to whom natural history was a pastime and—in a way—a vocation. Of these men Alfred O. Walker was a conspicuous example. [J. JOHNSTONE.]

BENEFACTIONS.

LIST *in accordance with Bye-Laws, Chap.* XVII. *Sect.* 1, *of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.*

1908.

Prof. Gustaf Retzius: Plaster cast of bust of Carl von Linné modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby: the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S.: Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

1909.

The Trustees of the Percy Sladen Memorial Fund: Second grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

Prof. James William Helenus Trail, F.R.S., F.L.S.: Gift of £100 in Trust, to encourage Research on the Nature of Protoplasm.

1910.

Royal Society: Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.

Sir Joseph Hooker: Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by James Tassie.

Prof. J. S. Gardiner: Payment in aid of illustrations, £35 0*s.* 6*d.*

Sir Frank Crisp: Donation in Trust for Microscopical Research, £200.

The Trustees of the Percy Sladen Memorial Fund: Third grant towards publication of Prof. Stanley Gardiner's Researches in the Indian Ocean, £200. (For third volume.)

1911.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the Indian Ocean Researches, £70.

The same: First Donation towards the fourth volume, £130.

1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15*s*. 2*d*.

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the Indian Ocean Researches, £140.

The same: First Donation towards the fifth volume, £60.

1913.

Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating Oenotheras, £60.

Sir Frank Crisp, Bt.: Wallichian Cabinets, £50.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

1914.

Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.

Miss Foot: Cost of illustration of her paper on *Euschistus*.

The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.

The same: First Donation towards the sixth volume, £190.

1915.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.

Miss Foot: Cost of second paper on *Euschistus*, £32 10*s*.

Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.

The same: towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.

Miss Marietta Pallis: Instalment of cost of her paper on Plav, £30.

Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.

Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

1916.

Mr. E. Heron-Allen: Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.

Messrs. H. Takeda and C. West: Contribution towards the illustration of their paper, £40.

Royal Society: Contribution towards the illustration of two papers by Prof. Dendy, £40.

The same: Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.

The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.

Miss Marietta Pallis: Balance of cost of her paper on Plav, £90 16*s.* 6*d.*

Sir Frank Crisp, Bt.: Phototyped copy of Dioscorides from the 'Codex Aniciæ Julianæ' at Vienna.

1917.

British Ornithologists' Union, etc.: Contribution towards cost of Mr. H. N. Ridley's paper, £20.

The Royal Society: Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.

Sir Frank Crisp, Bt.: 'Lindenia,' Ghent, 1891–1901. 17 vols. sm. fol.

1919.

Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.–xl. (1884–1912) and the Botanic entries in the 'Proceedings' for the same period.

1920.

The Royal Society: Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.

The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandii*, Part II., £60.

1921.

The Percy Sladen Memorial Fund: Additional Grant in aid of publication of 'Transactions,' 2nd ser., Zoology, vol. xvii. part 4, £72 10*s.*

The same: Grant in aid of publication of four papers on the Houtman Abrolhos Islands, £100.

The Royal Society: Donation in aid of papers by Mr. N. E. Brown and Mr. S. L. Moore, £90.

Dr. W. Rushton Parker: Donation of a large series of portraits of Naturalists and Persons after whom Genera have been named, and work on rearrangement and annotation of the entire collection.

Prof. C. S. Sargent, F.M.L.S.: Eight volumes issued by the Arnold Arboretum, including "The Bradley Bibliography."

Dr. B. Daydon Jackson: MS. Catalogue of each sheet in the Linnean Herbarium; bound in two volumes folio.

1922.

The late Sir Joseph Hooker: Donation of his Medals and Decorations. (Reversion to Linnean Society on Lady Hooker's decease.)

Anonymous donation in aid of publication of the late Dr. E. A. Newell Arber's paper, entitled "Critical Studies of Coal-Measure Plant-impressions," £60.

The Percy Sladen Memorial Fund: Cost of printing and illustrating 'Transactions,' 2nd. ser., Zoology, vol. xviii. pt. i.

1923.

Dr. W. Rushton Parker: (1) Donation of Oxford New English Dictionary; vols. i.–ix., vol. x. in parts, 4to, 1888–1923. (2) Encyclopædia Britannica; ed. XI. Cambridge, 1920–22. 32 vols. 4to.

E. Heron-Allen, Esq., F.R.S.: Contribution of £25 towards the cost of paper on the Foraminifera of Lord Howe Island.

1924.

The Percy Sladen Memorial Fund: Cost of printing and illustrating 'Transactions,' 2nd. ser., Zoology, vol. xviii. pt. ii.

1925.

An Anonymous Donor: New Presidential Chair, emblazoned with the Arms of the Society.

1926.

Mr. A. D. Michael: A large number of Books and Pamphlets from his Library.

The late Mr. A. O. Walker: £200 free of Legacy Duty.

An Anonymous Donor: £100 to establish a Fellowship in memory of the late Prof. E. A. Minchin, F.R.S., Sec.L.S.

The Royal Society: Donation in aid of publication of Mr. G. P. Farran's paper on Biscayan Plankton.—Part 14. The Copepoda, £60.

The late Mr. Frank Morey: £100 free of Legacy Duty.

The late Mr. George Lewis: Books and pamphlets on Entomological subjects.

Capt. E. G. Spencer-Churchill: A copy of a collotype reproduction of 'The herbal of Apuleius Barbarus . . . (MS. Bodley 130).'

The Percy Sladen Memorial Fund: Cost of printing and illustrating 'Transactions,' 2nd ser., Zoology, vol. xix. pt. i.

1927.

The late Mrs. Mary Anne Stebbing: £100 less Legacy Duty.

Treasurer's Accounts for the

(Presented at the Anniversary

Receipts and Payments of the Linnean Society

General

Receipts.	£	s.	d.	£	s.	d.
To Balance at 1st May, 1926	307	13	3			
Do. deposits, Fellows' postal account	62	0	8			
,, Cash in hand	3	19	9			
				373	13	8
,, Admission Fees				80	0	0
,, Arrears of Annual Contributions	69	11	6			
,, Annual Contributions for year	2317	0	0			
Do. in advance	155	9	2			
				2542	0	8
,, Interest on Investments				263	2	8
Do. Deposit				23	8	2
,, Income Tax recovered				47	1	5
,, Sales of Publications:—						
Transactions	64	17	1			
Journals	162	8	2			
Proceedings	3	17	10			
Library Catalogue	22	7	5			
				253	10	6
,, Donations in aid of Publications				37	0	0
,, Legacy from the late F. Morey, F.L.S.	100	0	0			
Do. Mrs. M. A. Stebbing, F.L.S.	90	0	0			
				190	0	0
,, Fellows' postal account, deposits				8	7	4
,, Miscellaneous Receipts				27	1	4
,, Library Fund				36	13	3

£3881 19 0

YEAR ENDED APRIL 30TH, 1927.

Meeting, May 24th, 1927.)

from May 1st, 1926, to April 30th, 1927.

Account.

PAYMENTS.	£ s. d.	£ s. d.
By House Expenditure: —		
Coal	85 7 0	
Electric Current £25 9 4		
Electrical Repairs 51 0 8		
	76 10 0	
Furniture	52 19 0	
Gas	11 19 8	
Repairs, pictures 20 0 0		
Do. sundry 4 17 9		
	24 17 9	
Sundry payments	25 13 11	
Taxes and Insurance	33 7 3	
Tea at Meetings	34 8 2	
		345 2 9
,, Library:—		
Books	39 7 6	
Periodicals	220 0 4	
Binding	162 5 3	
		421 13 1
,, Office Expenditure:—		
Miscellaneous Printing	117 16 3	
Postages and Sundry Expenses	97 16 3	
Stationery	51 17 4	
		267 9 10
,, Publications:—		
Printing	729 1 9	
Illustrations	128 17 6	
Distribution	78 16 6	
		936 15 9
,, Salaries and Wages, etc.		1155 16 4
,, Transfer to Separate Account: Minchin Fellowship Fund		1 11 0
,, Zoological Record: Donation for 1924 Volume		25 0 0
,, Purchase of £200 Conversion 4½ per cent. Stock 1940–44 (Library Fund)		188 16 0
,, Purchase of £88 9*s.* 8*d.* London County 5 per cent. Stock 1940–60 (Library Fund)		90 0 0
,, Percy Sladen Memorial Fund, Share of Zoological Transactions Sales		13 8 11
,, Linnean Medal		15 0 0
,, Fellows' postal account		7 15 5
,, Library Fund		95 2 9
,, Balance at 30th April, 1927	248 0 7	
Do. Fellows' postal account deposits	62 12 7	
,, Cash in hand	7 14 0	
		318 7 2
		£3881 19 0

Separate Account.

			£ s. d.
To Balance at 1st May, 1926 :—			
Westwood Fund	£39 7 2		
Trail Award Fund	3 4 2		
Crisp Award Fund	35 2 1		
Hooker Lecture Fund	52 11 2		
Goodenough Fund	10 12 2		
	140 16 9		
Less: Minchin Fellowship Fund overdrawn	1 11 0		139 5 9
„ Transfer from General Account Minchin Fellowship Fund			1 11 0
„ Annual Dinner Fund Receipts	32 6 0		
„ Anniversary Meeting Dinner Receipts	24 0 0		56 6 0
„ Interest on Investments :—			
Westwood Fund	£8 19 4		
Trail Award Fund	3 10 0		
Crisp Award Fund	7 10 0		
Hooker Lecture Fund	21 2 10		
Goodenough Fund	5 5 2		46 7 4
			£243 10 1

			£ s. d.
By Westwood Fund :—			
Grants for Illustrations in the Society's publications			14 2 4
„ Hooker Lecture Fund :—			
Hire of Lantern			3 12 6
„ Annual Dinner Fund :—			
Cost of Annual Dinner	32 6 0		
Cost of Anniversary Meeting Dinner	24 0 0		56 6 0
„ Balance at 30th April, 1927 :—			
Westwood Fund	£34 4 2		
Trail Award Fund	6 14 2		
Crisp Award Fund	42 12 1		
Hooker Lecture Fund	70 1 6		
Goodenough Fund	15 17 4		169 9 3
			£243 10 1

General Account.

	£	s.	d.			Market Value, 30th April, 1927. £	s.	d.
	450	0	0	Forth Bridge Railway 4 per cent. Stock (Library Fund: Bentham Bequest)	@ 76½	344	5	0
	1000	0	0	Metropolitan 3 per cent. Stock 1941	@ 82	820	0	0
	1200	0	0	India 3 per cent. Stock	@ 61	732	0	0
	1000	0	0	Eastern Bengal Railway 4 per cent. Irredeemable Debenture Stock	@ 77	770	0	0
	1000	0	0	Great Western Railway 4 per cent. Debenture Stock	@ 82	820	0	0
	312	0	0	London Midland & Scottish Railway 4 per cent. Preference Stock 1923	@ 71	221	10	5
£3496 0 0	3296	0	0	4½ per cent. Conversion Stock 1940–14	@ 97½	3213	12	0
	200	0	0	Ditto ditto (Library Fund: Walker and Morey Bequests)	@ 97½	195	0	0
	530	0	0	East India Railway 3½ per cent. Debenture Stock (Library Fund: Tagart Bequest)	@ 68	360	8	0
£188 9 8	100	0	0	London County 5 per cent. Stock 1940–60 (Minchin Fellowship Fund)	@ 101	101	0	0
	88	9	8	Ditto ditto (Library Fund: Stebbing Bequest)	@ 101	89	7	4
						£7667	2	9

Separate Account.

	£	s.	d.			£	s.	d.
£912 9 5	232	5	0	Metropolitan Water Board 3 per cent. "B" Stock (Westwood Fund)	@ 65	150	19	3
	638	4	5	Ditto ditto (Hooker Lecture Fund)	@ 65	414	16	10
	42	0	0	Ditto ditto (Goodenough Fund)	@ 65	27	6	0
	100	0	0	New South Wales 3½ per cent. Stock, 1930–50 (Trail Award Fund)	@ 73	73	0	0
	300	0	0	2½ per cent. Consolidated Stock (Crisp Award Fund)	@ 55	165	0	0
£200 0 0	50	0	0	4 per cent. Victory Bonds (Westwood Fund)	@ 91¼	182	10	0
	50	0	0	(Hooker Lecture Fund)				
	100	0	0	(Goodenough Fund)				
						£1013	12	1

HORACE W. MONCKTON, *Treasurer.*

We have (in conjunction with the Professional Auditor, who certifies as to all details) audited the Accounts of the Society for the year ended 30th April, 1927, and found them correct. We have verified the Investments and Bank Balances.

Dated this 16th May, 1927.

W. B. KEEN, *Chartered Accountant.*

A. B. RENDLE,
REGINALD CORY,
EDWARD T. BROWNE,
J. RAMSBOTTOM,
EDWARD A. BUNYARD,
ROBERT PAULSON,
Auditors

ADDITIONS AND DONATIONS

TO THE

LIBRARY.

1926–1927.

Note.—The sizes of the books are given in centimetres, the height and width being shown to the nearest centimetre, *e. g.*, 12·5×9·5 cm. is taken as 13×10.

Abeille (L'.). Mémoires d'entomologie. Par S.-A. Marseul avec le collaboration de plusieurs membres distingués de la Société entomologique de France. Tome 1, livr. 5, 1864 (2 copies, one bound); tome 5, livr. 6, 1869; vol. 27, pp. 281–88, 1892; tome 29, pp. 49–84, 269–88, 1896–99. *Paris*, 1864–99. [Lewis Bequest.]

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